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Radian Corp., Austin, TX

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PROCESS GAS CHROMATOGRAPHY STUDY

OF A

SELEXOL ACID GAS REMOVAL SYSTEM

by

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Coal Gasification	Stationary Sources	13H
Hydrogen Sulfide	Acid Gases	07B
Gas Chromatography	Selexol	07D
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ABSTRACT

This report contains the results of continuous compositional monitoring by process gas chromatography for three gas streams associated with the Selexol acid gas removal system at the Bi-Gas Pilot Plant in Homer City, Pennsylvania. Data were obtained from the inlet and outlet streams of the Selexol system during test periods in April and May, 1982. During the two tests, product gas composition data were logged for a total of 55 hours of plant operation.

The Bi-Gas Pilot Plant, which utilizes a two-stage, entrained-bed, high-pressure slagging gasifier, produces a product gas that is low in tars and heavy oils. This gas stream required very little cleanup prior to instrumental analysis. However, some problems were encountered in the analysis of the Selexol acid gas stream due to the presence of high levels of naphthalene. The process gas chromatographs (GCs) performed well and remained very stable during the test periods. Material balances based on GC analyses and process flow rate data show a high degree of material accountability. The H_2S removal efficiency of the Selexol absorber was approximately 99% during the test periods.

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SECTION 1

INTRODUCTION

As part of Radian Corporation's contract, "Environmental Assessment of Low- and Medium-Btu Gasification Processes," with the U.S. Environmental Protection Agency (EPA), two sets of process gas chromatographs were operated at the Bi-Gas Coal Gasification Pilot Plant in Homer City, Pennsylvania during the periods April 21-22 (Run 19A) and May 18-19 (Run 19B), 1982. The process gas chromatographs (GCs) provided semi-continuous monitoring (continuous data logging) of two streams simultaneously. The process GCs were used to:

- acquire gas compositional data for the Selexol acid gas removal process,
- evaluate the potential for the use of this technique for monitoring gas streams in coal gasification facilities, and
- provide a means of "tracking" process operation in order to assess the conditions at which samples were collected.

Concurrent with the data acquisition aspect of the EPA Low-Btu program, an Electric Power Research Institute (EPRI) program and a Department of Energy (DOE) program were implemented. The EPRI test program was focused on emissions measurement from a coal gasification facility. The DOE program addressed the environmental, health, and safety (EH&S) aspects of coal gasification.

The EPRI program has two goals:

- establishing procedures by which assessment of coal gasification emissions may be expedited and
- obtaining information that will serve as input to future commercialization efforts and a basis for estimating the emissions from commercial-scale facilities.

Achievement of the first goal requires the development and testing of sampling and analytical procedures that will provide accurate and reliable data on the composition of emission streams. To meet this first goal, various sampling and analytical techniques were developed and verified at the Bi-Gas site.

The other test program, funded by DOE*, addresses the environmental, health, and safety (EH&S) aspects of coal gasification processes to the degree that they impact the rate of development of the commercial gasification industry in the U.S. The objectives of the EH&S program are to:

- Identify potential EH&S concerns early in the development stage of process technology,
- Gather the necessary data required to resolve these concerns,
- Analyze and scale-up the data so that EH&S effects can be projected for commercial-size processing equipment, and
- Develop environmental control equipment and/or demonstrate process modifications that will reduce EH&S effects to acceptable levels.

The test program implemented at the Bi-Gas plant was designed to obtain EH&S data which are both pertinent and scalable.

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*Under Contract Number DE-AC21-81MC16547 (entitled "Environmental, Health, and Safety Program Plan Implementation").

The program implemented at the Bi-Gas facility integrated the testing and data requirements for all three funding agencies into one test plan. This report focuses on the EPA data acquisition results and summarizes the plant operation and the instrument operation for the process gas chromatographs over the two test periods. Reports are being prepared by EPRI and DOE that will present detailed data and results for the overall program.

Descriptions of the overall test program at the Bi-Gas facility, in general, and the EPA-funded analyses, in particular, are presented in Section 2. A description of the process GCs is given in Section 3 as well as a summary of the instrument operation during the test periods. Process GC and corresponding grab sample analytical results are discussed in Section 4.

SECTION 2

PROCESS DESCRIPTION AND TEST SCHEDULE

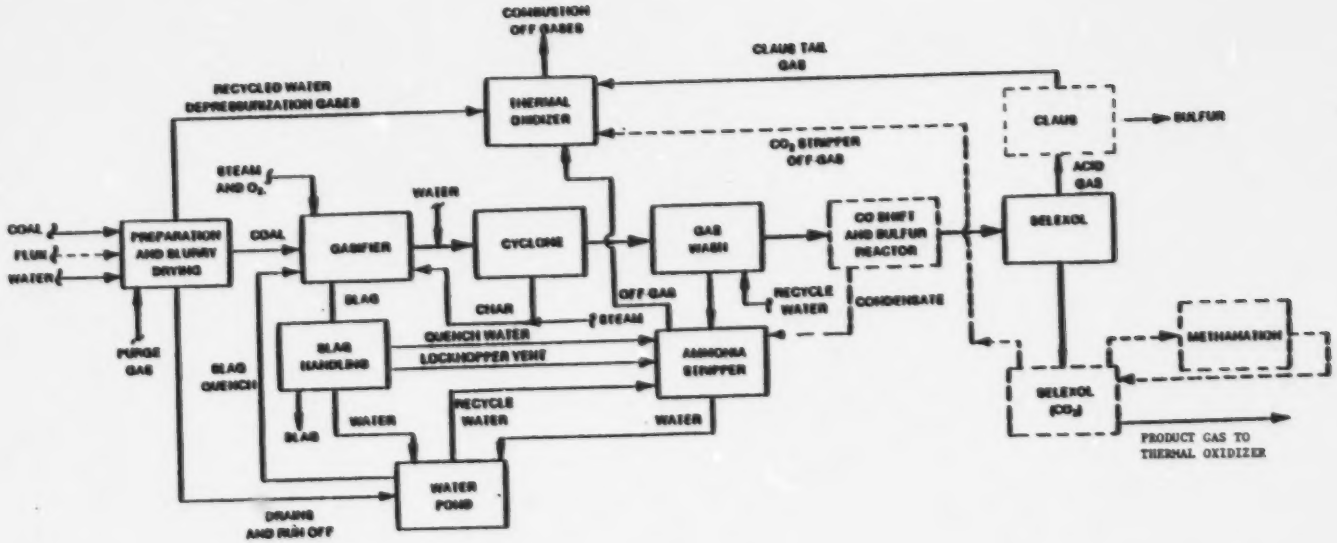
Radian conducted sampling and analysis of process streams at the Bi-Gas Pilot Plant in Homer City, Pennsylvania during three run episodes (Plant Runs 19, 19A, and 19B) during a two-month period, April and May, 1982. The Bi-Gas Pilot Plant was funded by the Department of Energy and was operated by Stearns-Roger Engineering Corporation. The coal used in the tests was Pittsburgh #8. During the tests, the nominal coal feed and product gas generation rates were ∿2000 and ∿6000 kg/hr, respectively.

The first test of this series, Run 19, was conducted in early April and lasted 12 hours. No process GC data were obtained during this time. During the next test (19A) from 0800 hours on April 21 until 1600 hours on April 22, 1982, the process GCs were used to collect compositional data from the Selexol absorber inlet and outlet gas streams. The next test, 19B, was conducted May 18-19, 1982. During this test period, the process GCs were used to monitor the Selexol inlet and Selexol acid gas streams.

2.1 PROCESS DESCRIPTION

The pilot plant centers around a pressurized, entrained-bed, two-stage, slagging gasifier. Figure 1 presents a block flow diagram of the plant. Dashed lines indicate those components which were not in operation during the test program. The configuration (excluding auxiliary components) in effect for the test program was composed of seven modules:

- Coal feed preparation,
- Gasification,



(- - - not in use during Runs 19A and 19B)

Figure 1. Bi-Gas pilot plant.

- Slag handling,
- High pressure gas washing,
- Acid gas removal (Selexol),
- Ammonia stripping, and
- Thermal oxidation.

Each of these modules is briefly described below.

2.1.1 Coal Feed Preparation

Coal slurry is pumped up to system pressure, heated, and then injected into a spray drier along with hot recycle gas. The dried coal is separated from the gas in a cyclone then transported to the gasifier.

2.1.2 Gasification

Dried coal and fuel gas are mixed with steam and injected into the bottom of the second-stage of the gasifier. Devolatilization and partial gasification occur, promoted by hot gases rising out of the Stage 1 combustor. The raw gas exits the gasifier and undergoes a preliminary water quench to a temperature of 700 K. The gas then enters a cyclone where entrained char is captured and recycled to Stage 1 via steam eductors. Combustion of this char supplies heat for the gasification process. Molten slag flows from Stage 1 into a water quench prior to removal from a lockhopper.

2.1.3 Slag Handling

The quenched slag from the gasifier drops into one of two alternating lockhoppers. The slag is emptied periodically by venting the lockhopper and sluicing the slag into the slag bin. The slag is crushed, and the resulting slurry is pumped to a clarifier for solids removal with the overflow going to a holding pond.

2.1.4 High Pressure Gas Washing

After passing through a spray quench and a cyclone for removal of entrained char and ash, the raw product gas enters the gas washer through a wet Venturi nozzle. The washer is a tray tower operating essentially at gasifier pressure. The gas is scrubbed with recirculating water. Blowdown water goes to the ammonia stripper. The washed gas is routed to the Selexol unit via a knockout vessel and heat exchanger for further cooling.

2.1.5 Acid Gas Removal (Selexol)

Gas from the gas washer is contacted with organic solvent in a tray tower (absorber). The H_2S, CO_2, some reduced sulfur species, HCN, and trace hydrocarbons are absorbed by the solvent. The cleaned gas is then directed to the thermal oxidizer.

The H_2S-rich solvent from the absorber is flash-evaporated at 1880 kPa and then 440 kPa and the flash gases are vented to the thermal oxidizer. The flashed solvent is then indirectly stripped at 422 K to release the acid gases. The regenerated solvent is returned to the absorber, while the acid gases that were stripped from the solvent are routed to the thermal oxidizer.

2.1.6 Ammonia Stripper

The ammonia stripper is a modified gas washer, with an upper packed section and a lower tray section. The main input stream, the gas washer blowdown, enters the bottom of the stripper and is contacted with steam. Caustic is added to the top of the tower to neutralize acid gases and release "fixed" ammonia. The overhead is vented to the thermal oxidizer, and the column bottom flows to a holding pond.

2.1.7 Thermal Oxidation

The product gas from Selexol as well as several waste and transient gas streams flow to the thermal oxidizer. Fuel gas is added to the unit to maintain stable combustion.

2.2 TEST SCHEDULE

The Bi-Gas test program funded by the EPA centered around the Selexol acid gas removal system. The process gas chromatographs were used to monitor three gas streams during the two test runs. The streams that were monitored during each test are:

Run 19A (April 21-22)	Run 19B (May 18-19)
Selexol absorber inlet	Selexol absorber inlet
Selexol absorber outlet	Selexol acid gas

Two sets of instruments, each containing three gas chromatographs, were used to monitor:

- Hydrocarbons: C_1-C_4+;
- Sulfur Species: H_2S, COS, SO_2, CS_2; and
- Major gases: CO_2, N_2, O_2, H_2, CO, CH_4.

In addition to the EPA-funded process GC monitoring, liquid and gas phase samples and operating data were collected from the Selexol unit. Samples were collected from all influent and effluent gas streams including the high- and low-pressure flash vents. The gases evolved from the controlled flashing of the absorber bottoms and the high-pressure flash bottoms were also collected for analysis in conjunction with their corresponding liquid streams. Figure 2 presents a schematic of the Selexol module with the sample collection points indicated as follows:

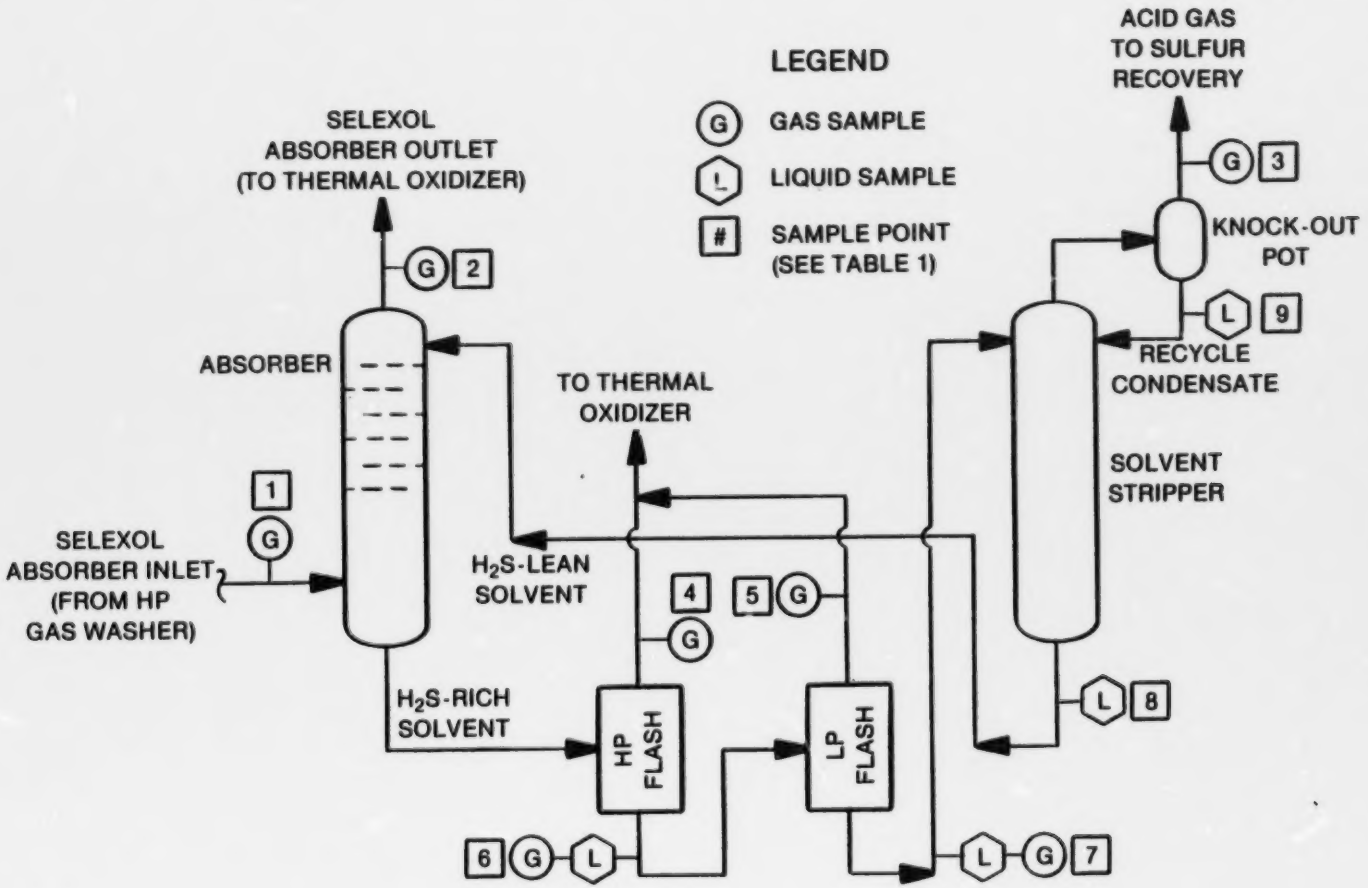


Figure 2. Selexol acid gas removal system.

1) inlet,
2) outlet,
3) acid gas,
4) high-pressure vent,
5) low-pressure vent,
6) absorber bottoms,
7) low-pressure flash bottoms,
8) lean solvent, and
9) acid gas condensate.

A complete listing of the Selexol locations sampled as well as the type of samples and analyses to be performed are given in the test matrix in Table 1.

As part of the overall test program, samples and data were also collected from the:

- high pressure gas washer,
- gasifier,
- slag handler, and
- ammonia stripper.

Table 2 presents the test matrix for the sampling and analytical work performed for these four process units.

TABLE 1. TEST MATRIX--ACID GAS REMOVAL

	Stream No. 1	2	6*	7*	8*	4*	5*	3	9	*
	Inlet Gas to Absorber	Outlet Gas from Absorber	H_2S-Rich Solvent	Low Pressure Flash Bottoms	H_2S-Lean Solvent	High Pressure Flash Vent	Low Pressure Flash Vent	Acid Gas to Claus†	Acid Gas Knockout Condensate	Make-Up Solvent to Selexol
Gas Components										
Fixed Gases	E	E				D	D	E		
H_2O	E	E				D	D	E		
Sulfur Species	E	E				D	D	E		
Light Hydrocarbons	E	E				D	D	E		
Organics	E	E						E		
NH_3, HCN	E	E				D	D	E		
Trace Elements	E	E				D	D	E		
Liquids										
Water Quality									D	
Trace Elements			D	DO	D				D	D
Organics (Extractable)			D	D	D				D	D
Organics (Purgeable)			D	D	D				D	D
Dissolved Gases			D	D						
S and CO_2 Content			D	D	D					
Solids and Particles										
Proximate/Ultimate										
Minor Elements										
Trace Elements										
Loading			D	D	D					
Size Distribution										
Morphology										
Physical Properties										
Organics (Extractable)										
Sulfur Forms										
Leaching										
Purity										

D - Included under DOE funding.
E - Included under EPRI and/or EPA funding.
O - Sample will be taken and preserved for optional analysis.
* - Internal Selexol streams considered proprietary by Norton Chemical Company.
† - Because the Claus unit was not operating during the test program, Selexol acid gas was vented to the thermal oxidizer.

TABLE 2. BI-GAS TEST MATRIX

	Gasifier			High Pressure Gas Washer				Slag Handling	Ammonia Stripper	
	Coal	Char	Fuel Gas	Scrubbed Gas	High Pressure Service Water	High Pressure Washer Bottoms	Suspended Solids in High Pressure Gas Washer Bottoms	Slag	Gas Washer Bottoms	Slag Quench Blowdown
Gas Components										
Fixed Gases			S	D						
H_2O										
Sulfur Species				D						
Light Hydrocarbons			S	D						
Organics										
NH_3, HCN										
Trace Elements										
Liquids										
Water Quality					D	D			E	E
Trace Elements					DO	DO			E	E
Organics (Extractable)					D	D			E	E
Organics (Purgeable)					D	D			E	E
Dissolved Gases						E			E	
S and CO_2 Content									E	E
Solids and Particles										
Proximate/Ultimate	DO	DO						DO		
Minor Elements	DO	DO					D	DO		
Trace Elements	DO	DO						DO		
Loading								S		
Size Distribution	S	S						DO		
Morphology								DO		
Physical Properties								DO		
Organics (Extractable)		DO						E		
Sulfur Forms	DO	E						DO		
Leaching		DO								
Purity										

D - Included under DOE funding.
E - Included under EPRI and/or EPA funding.
S - Collected by Stearns-Roger Engineering Corp.
O - Sample will be taken and preserved for optional analysis.

SECTION 3

INSTRUMENTATION

This section contains a description of the process GCs including types of detectors and columns used for the analysis of the three process streams. Also included is a description of the instrument operation and problems encountered during the tests.

3.1 INSTRUMENT DESCRIPTION

Two sets of process gas chromatographs were used during the test program:

- Applied Automation (AA) Model 7170 and
- Bendix Model 7000.

Both GC systems are housed in a 2.4m by 3.6m trailer-mounted portable building. The insulated enclosure is heated and air conditioned to provide a stable atmosphere for the instruments and the data acquisition system. All necessary electrical wiring, instrument air filtration, and drying systems are contained in the enclosure. Instrument air can be provided by portable air compressors in the event that plant pressurized air is not available.

Each process GC system provides the following detectors:

- Flame ionization for C_1-C_4+ hydrocarbons;
- Flame photometric for H_2S, COS, SO_2, and CS_2; and
- Thermal conductivity for CO_2, CO, H_2, N_2, O_2, CH_4, and H_2S.

The flame ionization detector (FID) of the Bendix 7000 instrument was not operational during the tests due to an undelivered factory back order for parts.

A total of three process streams were monitored during the tests. The sample acquisition system for the Selexol inlet and outlet gas streams was the same. The g sample was taken from a valve tap, filtered, and the pressure reduced from 5250 to 440 kPa using a stainless steel two-stage gas regulator. The sample was then transported to the analytical instruments via heat-traced 0.64 cm Teflon tubing that was maintained at 394 K.

The acquisition system for the Selexol acid gas sample was similar except this gas stream was not under pressure. Therefore, after filtration, a Teflon-lined pump was used to provide sample flow through the heat-traced transport line.

A separate gas conditioning system for each of the two GC systems was used to further filter, dry, and deliver sample gas to each of the analyzers. Each analyzer was equipped with a sample loop/valve injection system through which the sample was continuously purged. All of the instruments utilize multiple columns and automatic valve sequencing for component speciation. A Spectra-Physics 4000 Integrator was used to record and integrate the chromatographic output. The Spectra-Physics also controlled the recycle time for each of the five operating GCs.

Standard blends of each of the components of interest were analyzed before the monitoring period. Standards were also analyzed during the middle and at the end of each period for each of the major species.

The instrumental operating parameters were:

AA WITH FLAME PHOTOMETRIC DETECTOR:

CARRIER:	Nitrogen
FLOW:	Column 35 ml/min
OVEN AND DETECTOR TEMPERATURE:	380 K
COLUMNS:	• 0.3m x 3.2 mm Teflon, 40% Carbowax on Chromosorb P 80/100 mesh • 3.7m x 3.2 mm stainless steel, 1% TCEP on Porasil B 80/100 mesh
SAMPLE SIZE:	10 µl
CYCLE TIME:	4 minutes

AA WITH FLAME IONIZATION DETECTOR:

CARRIER:	Nitrogen
FLOW:	Column 30 ml/min; backflush 30 ml/min
OVEN AND DETECTOR TEMPERATURE:	413 K
COLUMNS:	• 0.6m x 3.2mm stainless steel, Porapak T 80/100 mesh • 4.3m x 3.2mm stainless steel, Porasil A 80/100 mesh • 0.3m x 3.2mm stainless steel, Chromasorb G 80/100 mesh
SAMPLE SIZE:	170 µl
CYCLE TIME:	8 minutes

AA WITH THERMAL CONDUCTIVITY DETECTOR:

CARRIER:	8.5% Hydrogen in Helium
FLOW:	Column 6 ml/min; Reference 65 ml/min; Backflush 35 ml/min.
OVEN AND DETECTOR TEMPERATURE:	348 K
COLUMNS:	• 3.9m x 3.2mm stainless steel, Porapak Q, 50/80 mesh • 2.44m x 3.2mm stainless steel, Molecular Sieve 5A, 40/60 mesh
SAMPLE SIZE:	10 cc
CYCLE TIME:	10 minutes

BENDIX WITH FLAME PHOTOMETRIC DETECTOR:

CARRIER:	Air
FLOW	Column 50 ml/min; Backflush 40 ml/min
OVEN AND DETECTOR TEMPERATURE:	354 K
COLUMNS:	• 3.1m x 3.2mm Teflon, Bendix Sulfur Gas Packing (BSG) • 0.91m x 3.2mm Teflon, BSG • 2.4m x 3.2mm Teflon Porapak Q 50/80 mesh, HNO_3 washed • 0.6m x 3.2mm stainless steel, BSG
SAMPLE SIZE:	20 µl
CYCLE TIME:	8 minutes

BENDIX WITH THERMAL CONDUCTIVITY DETECTOR:

CARRIER:	8.5% Hydrogen in Helium
FLOW:	Column 45 ml/min; Reference 50 ml/min; Backflush 40 ml/min.
OVEN AND DETECTOR TEMPERATURE:	333 K
COLUMNS	• 3.9m x 3.2 mm stainless steel, Porapak Q 50/80 mesh • 3.0m x 3.2mm stainless steel Molecular Sieve 5A 40/60 mesh
SAMPLE SIZE:	5 cc
CYCLE TIME:	10 minutes

3.2 INSTRUMENT OPERATION

The process gas chromatographs (GCs) performed well and remained very stable during the test periods. Limitations in the data obtained with the GCs were caused by:

- either mechanical problems with plant operation or
- stream compositions beyond the analytical capability of the instrumentation as it was configured during the tests.

The impact of mechanical problems with plant operation on data collection is a reality during any source test. The impact on the process GCs can be minimized or eliminated by early notification of these problems to the process GC operator. For the second item above, modification of the sample preparation techniques can easily be made for subsequent tests with the process GCs.

A description of the factors which limited the quality and quantity of data obtained during the test periods is discussed below.

An attempt was made to monitor the acid gas during Run 19A. Sample transport lines were switched from the Selexol inlet to the acid gas. However, by the time the switch was effected and new instrument calibrations performed, plant operation was suspended due to mechanical problems. During the plant shutdown operations, condensate backed up into the acid gas transport line and was subsequently drawn into the process GCs. The introduction of this moisture into the instruments preempted final instrument calibration checks.

Analysis of sulfur species on the Selexol absorber inlet gas required a very small sample loop in order to determine H_2S by FPD. The small sample volume yielded COS values that were very near the instrument detection limit.

A full set of analyses were attempted on the acid gas during Run 19B, but analysis of sulfur species by FPD was not possible. With the available fixed sample volume, both H_2S and COS were beyond the linear range of the detector. Neither SO_2 nor CS_2 were detected by the FPD. The H_2S concentration was high enough to allow quantification by thermal conductivity detection.

High concentrations of hydrocarbons in the acid gas presented additional problems. Crystalline naphthalene was formed in the filter holder prior to the sample transport line. As a result of the high hydrocarbon concentration, the C_4+ components, which go to the detector prior to C_1-C_3, overloaded

the detector. The signal responses from C_1-C_3 therefore were indistinguishable from the C_4+ peak signal and could not be quantitated. Grab sample analyses of this stream indicate that the C_4+ fraction was greater than 1% of the gaseous molar volume during part of the run episode. Methane was measured as a major gas specie by TCD.

SECTION 4

RESULTS

During the two tests, the analyses conducted (with the process GCs) on the individual gas streams were:

	Major species	Volatile sulfur species	Light hydrocarbons
Run 19A, April 21-22, 1982			
Selexol Absorber Inlet	✓	✓	✓
Selexol Absorber Outlet	✓	✓	
Run 19B, May 18-19, 1982			
Selexol Absorber Inlet	✓	✓	
Selexol Acid Gas	✓	✓	✓

The GC compositional results for both test periods are discussed in Section 4.1. Section 4.2 presents the results of mass accountability calculations developed for Run 19A.

4.1 PROCESS GC RESULTS

Samples of the gas streams were collected and analyzed approximately every ten minutes using the process GCs. In addition, grab samples (gas bombs) were collected three to five times at each of the locations. Graphs depicting hourly averages of the analyses for major gas components are presented in Figures 3 and 4. Corresponding grab sample data are also plotted for comparative purposes. The discontinuity for the Selexol inlet data in Figure 3 is due to a temporary loss of instrument carrier gas flow. The large excursion around midnight during Test 19A is a reflection of the shutdown of the coal feed which occurred following the slag burner shutdown

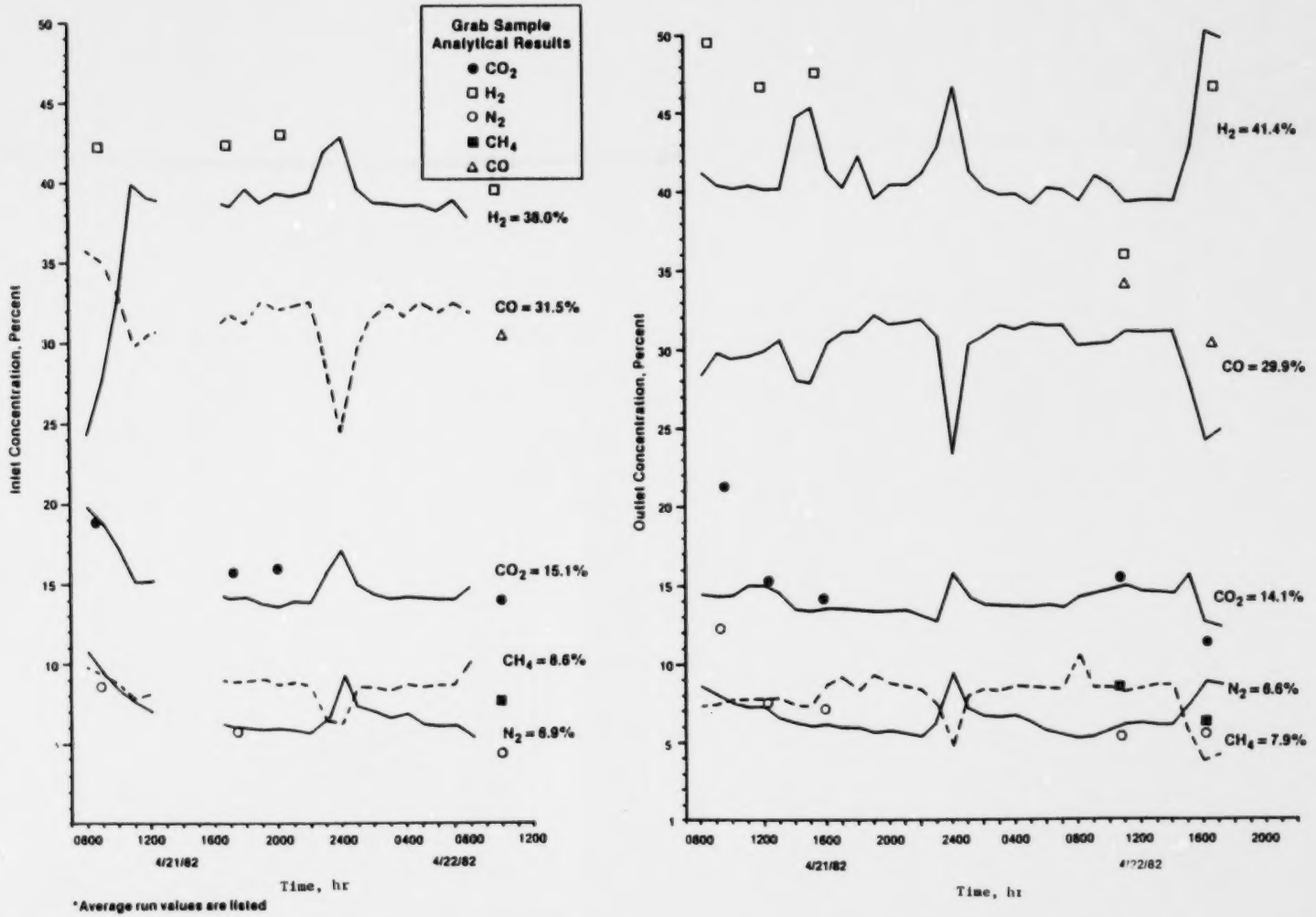


Figure 3. Selexol inlet and outlet, process GC data*, Run 19A.

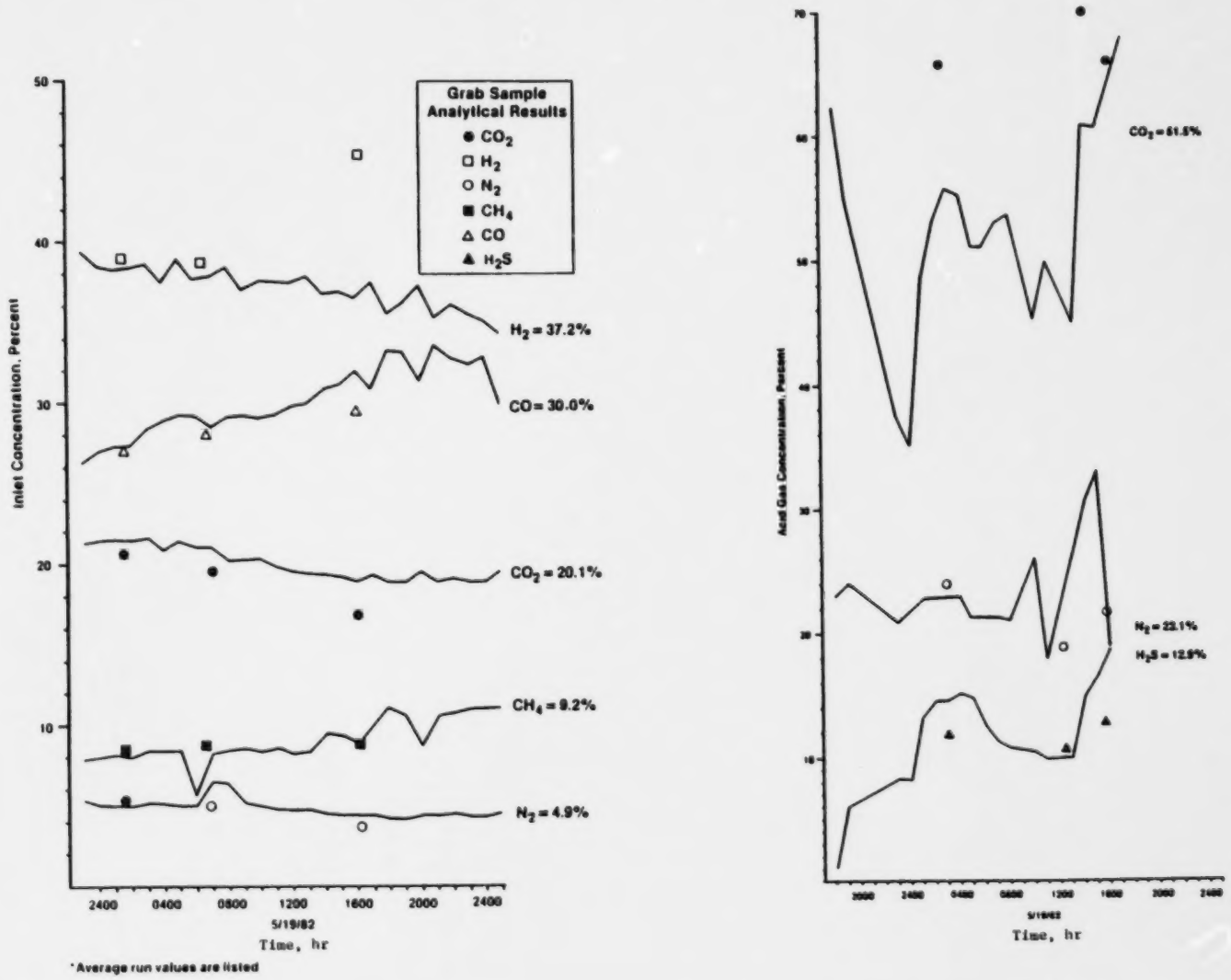


Figure 4. Selexol inlet and acid gas, process GC data*, Run 19B.

at 2310 hours. As shown in the figures, the process GC data are generally in good agreement with the grab sample data.

Average gas compositions for Tests 19A and 19B are presented in Table 3. The sulfur species data indicate approximately 99% removal of H_2S from the inlet gas stream during Test 19A. There also appears to be some removal of COS; however, the inlet analysis for COS for both test periods was near the detection limit and is therefore only an approximation. COS concentrations in the acid gas were quite high, significantly beyond the linear range of the detector, and therefore could not be quantified. The data from Run 19B show that several species were enriched in the acid gas including CO_2, N_2, H_2S, COS, and some hydrocarbons. The hydrocarbons could not be quantitated due to the high concentration of the C_4+ component. However, a grab sample analysis of this stream during Run 19B indicates that the C_4+ fraction was greater than one percent of the gaseous molar volume during that part of the run episode.

The acid gas H_2S concentration measured in Run 19B (average of 12.9%) is sufficiently enriched such that it could be routed to a Claus unit for sulfur recovery. Hydrocarbon concentrations greater than about one percent can create combustion control problems in a Claus unit and adversely affect product sulfur quality. However, it should be noted that only one hydrocarbon analysis on the acid gas stream was performed during the tests.

Insufficient data concerning the Selexol unit operation are available to make firm conclusions about the sulfur species removal or hydrocarbon enrichment in the acid gases. The Selexol unit L/G (liquid-to-gas) ratio during the runs was much higher than the design value. In addition, an evaluation of the Selexol unit operating conditions and internal stream compositions would be required before it could be concluded that the performance noted in these runs is representative of Selexol unit performance on the product gas stream treated at the Bi-Gas facility.

TABLE 3. AVERAGE GAS COMPOSITION FOR THE BI-GAS PILOT PLANT, RUNS 19A AND 19B

Species	RUN 19A		RUN 19B	
	Selexol Absorber Inlet	Selexol Absorber Outlet	Selexol Absorber Inlet	Selexol Acid Gas
H_2	38.0%	41.4%	37.2%	ND
CO_2	15.1%	14.1%	20.1%	51.5%
N_2	6.9%	6.6%	4.9%	23.1%
CH_4	8.6%	7.9%	9.2%	ND
CO	31.5%	29.9%	30.0%	ND
H_2S	0.41%	<4 ppm	0.38%	12.9%
COS	200 ppm*	76 ppm	100 ppm*	†
C_2H_6	36 ppm	NA	NA	†
C_4+	1100 ppm	NA	NA	†

ND = not detected

NA = not analyzed

* estimated value

† unable to quantify; detector overloaded

4.2 MASS ACCOUNTABILITY CALCULATIONS (Run 19A)

Mass balances around the Selexol unit were calculated for periods approximating steady-state operation. The degree of closure provides a measure of the validity for the gas stream compositional data generated by the process GCs. The mass balances developed include the following Selexol streams:

Input	Output
Selexol absorber inlet gas	Selexol absorber outlet gas Selexol acid gases

The balance does not include the contributions of the high- and low-pressure flash vents. No flow measurement devices were installed on these streams and no access was available for flow measurements. The flow rates of these streams, however, are very small compared to the acid gas stream rate exiting the Selexol unit.

Based on an evaluation of the process operating parameters, Run 19A (0800 hours 4/21/82 to 1600 hours 4/22/82) had the longest steady operation. Run 19B had approximately the same duration (2200 hours 5/18/82 to 0400 hours 5/20/82), but the operating parameters during the run indicated steady rates of change over the run, rather than deviations around a steady state. The coal feed rate was gradually increased over the run period, the Selexol absorber temperature and pressure showed a steady decrease, and the Selexol inlet gas flow rate increased for the initial eight hours and slowly decreased over the rest of the run. The absorber liquid-to-gas ratio was significantly increased compared to Run 19A. A summary of the operating parameters and gas compositions for Runs 19A and 19B is shown in Figures 5 through 11.

From the data presented in Figures 5 through 11, Run 19A was selected for material balance calculations since operation more closely

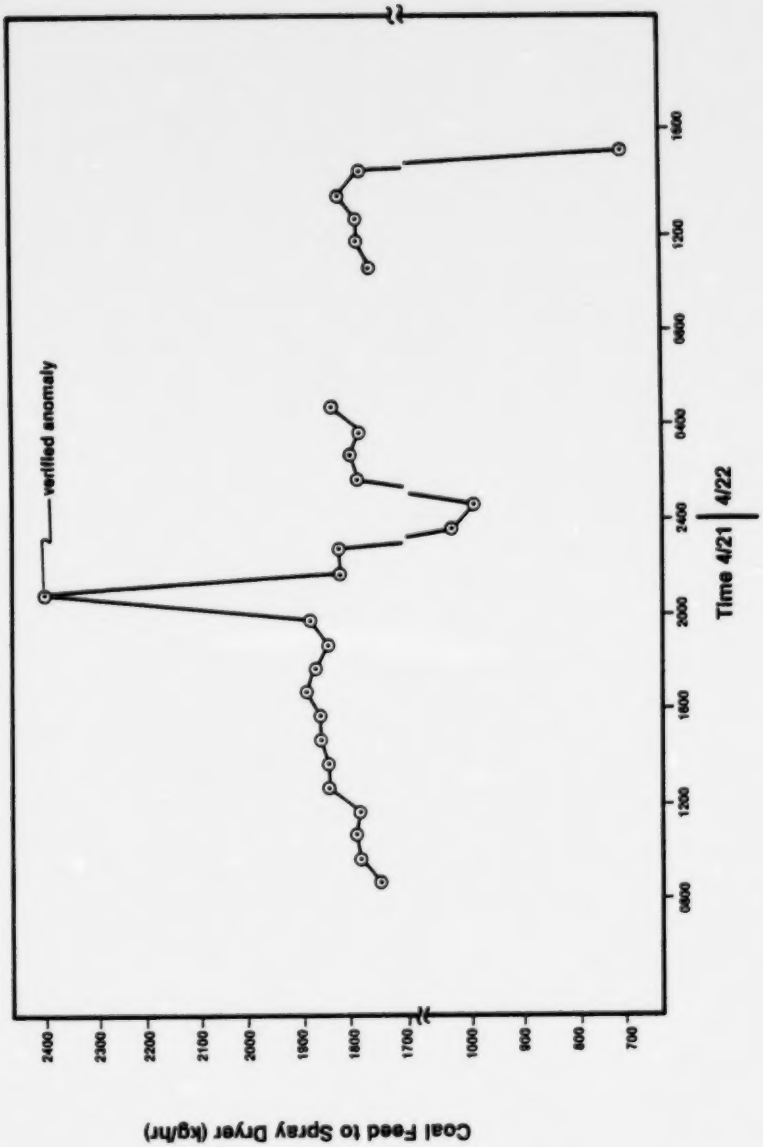


Figure 5. Run 19A, coal feed rate.

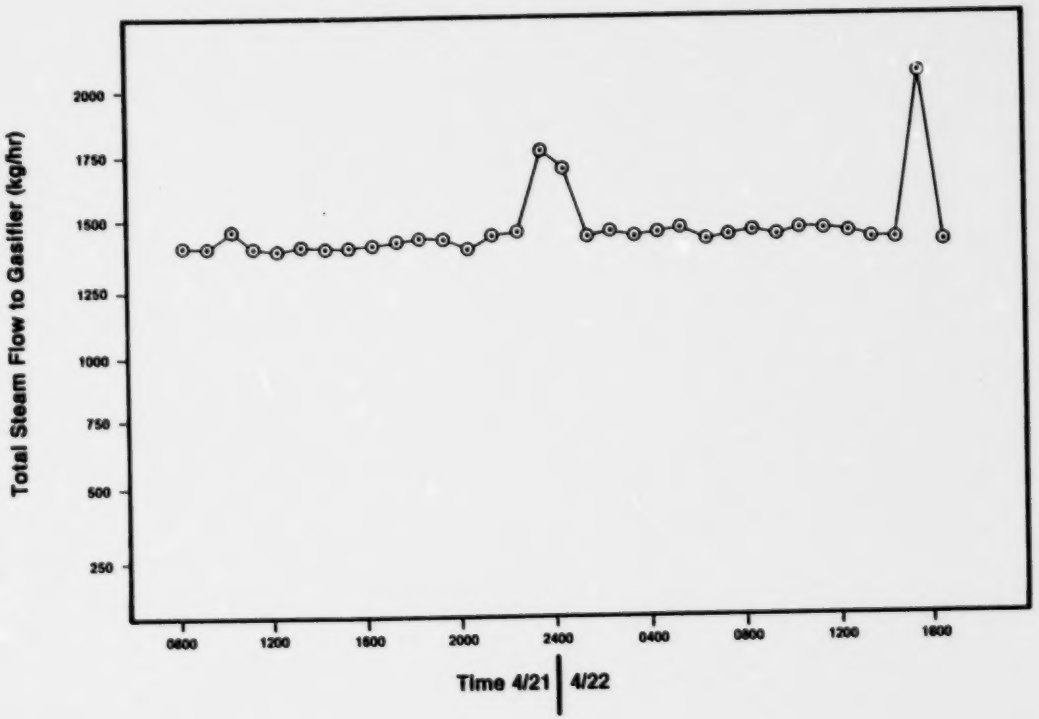


Figure 6. Run 19A, steam feed rate.

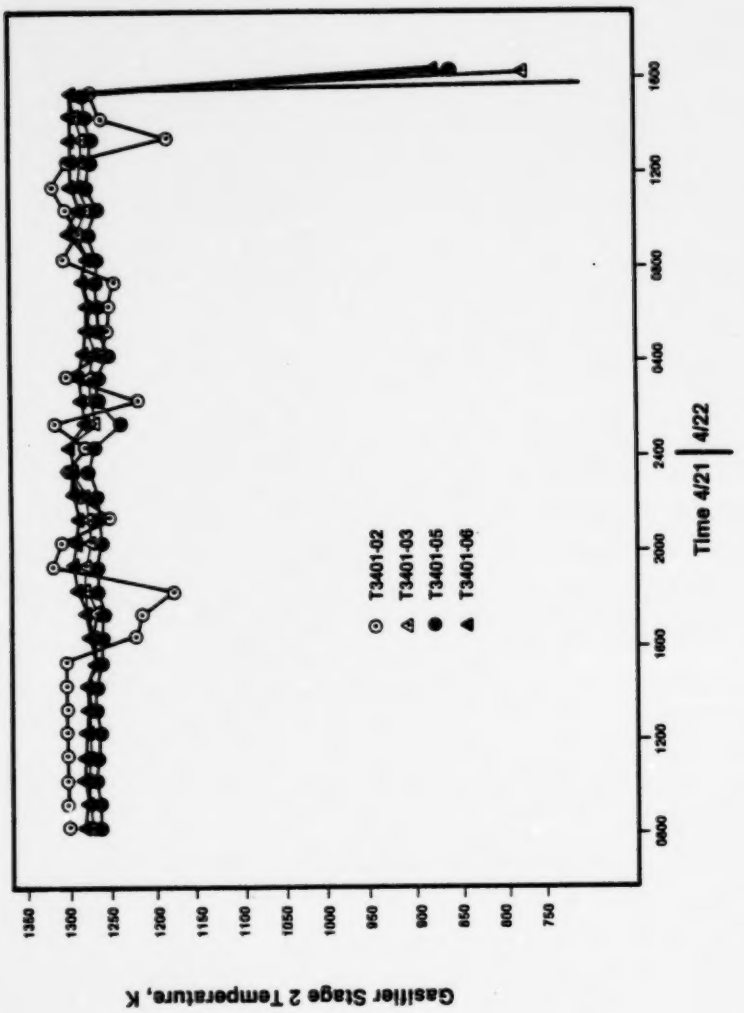


Figure 7. Run 19A, gasifier Stage 2 temperature.

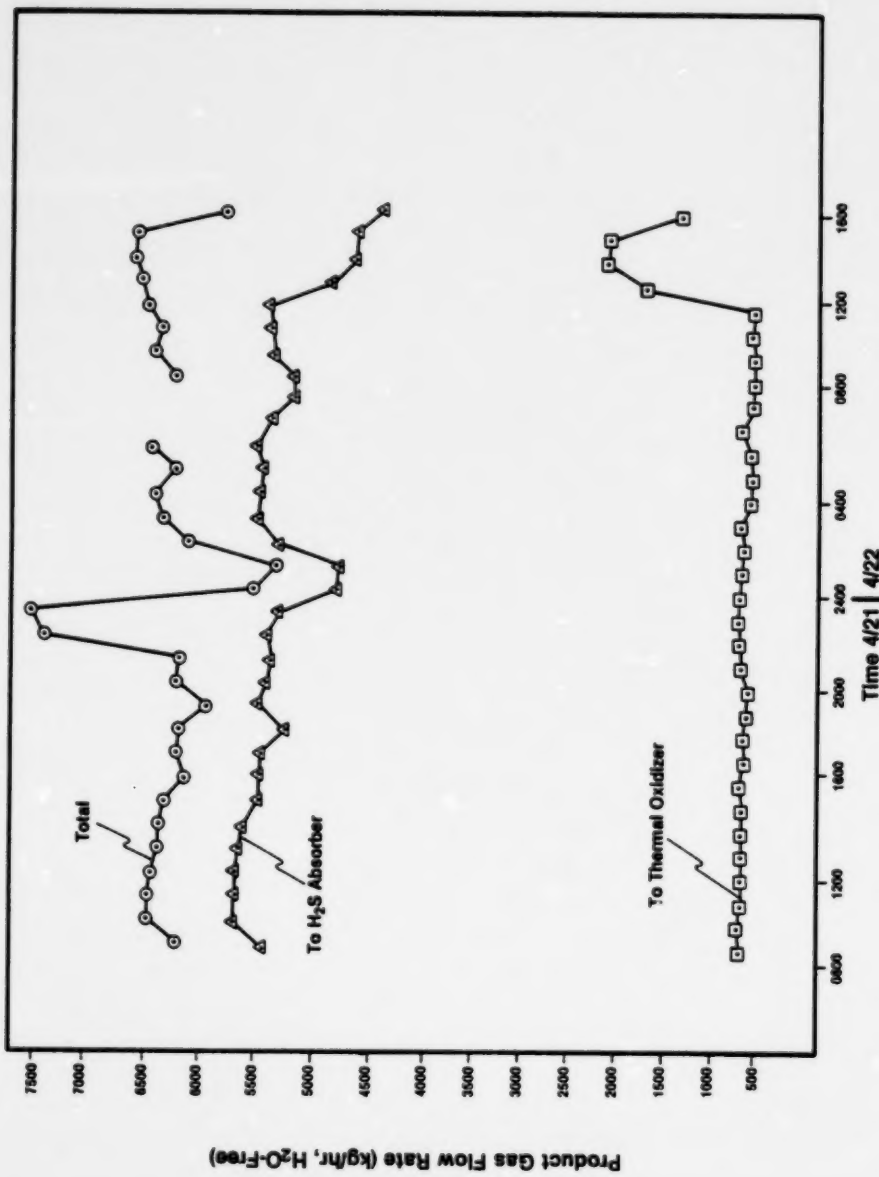


Figure 8. Run 19A, product gas flow rates.

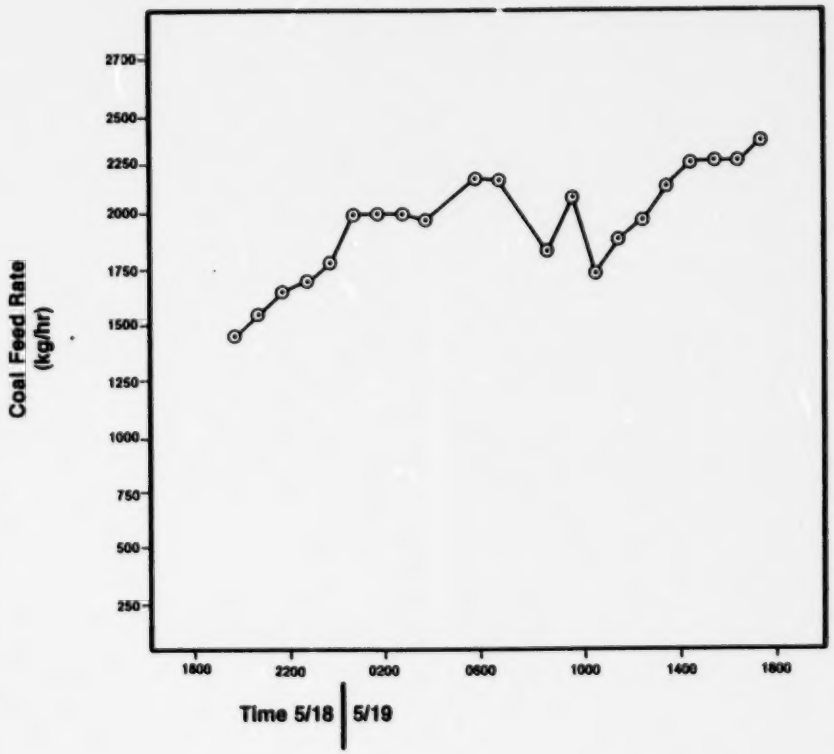


Figure 9. Run 19B, coal feed rate.

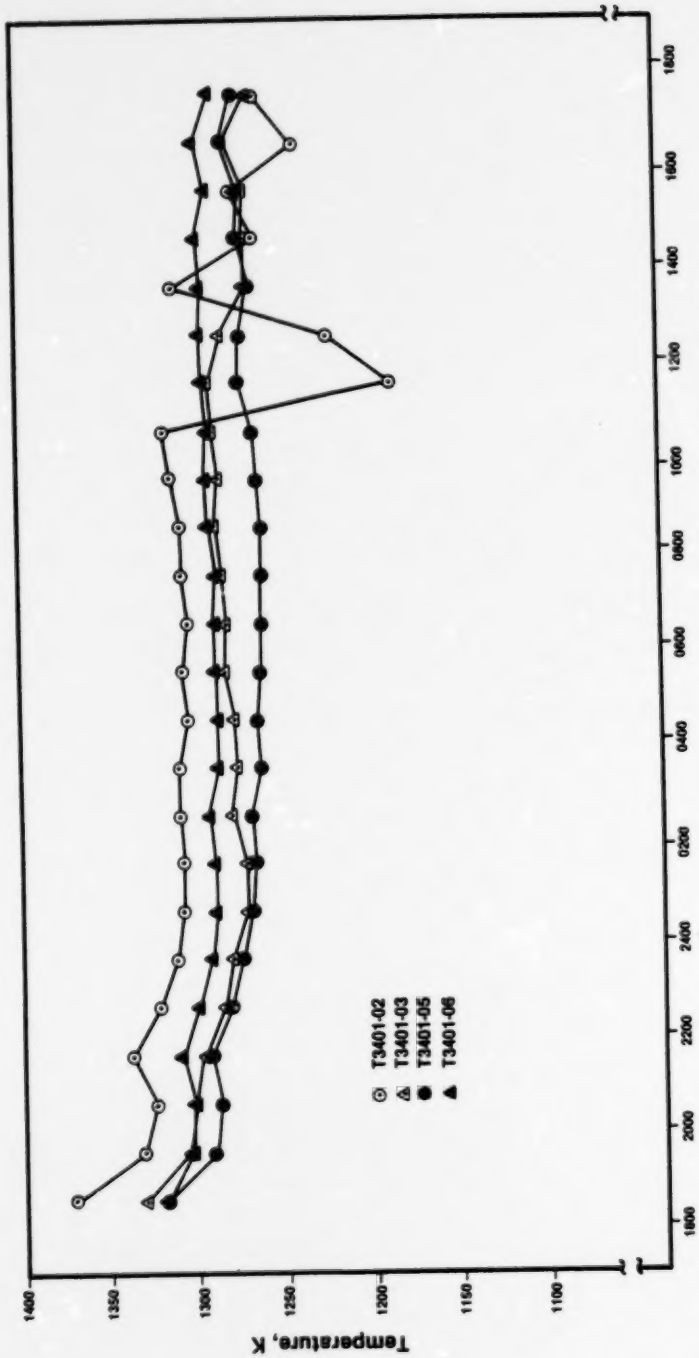


Figure 10. Run 19B, gasifier Stage 2 temperature.

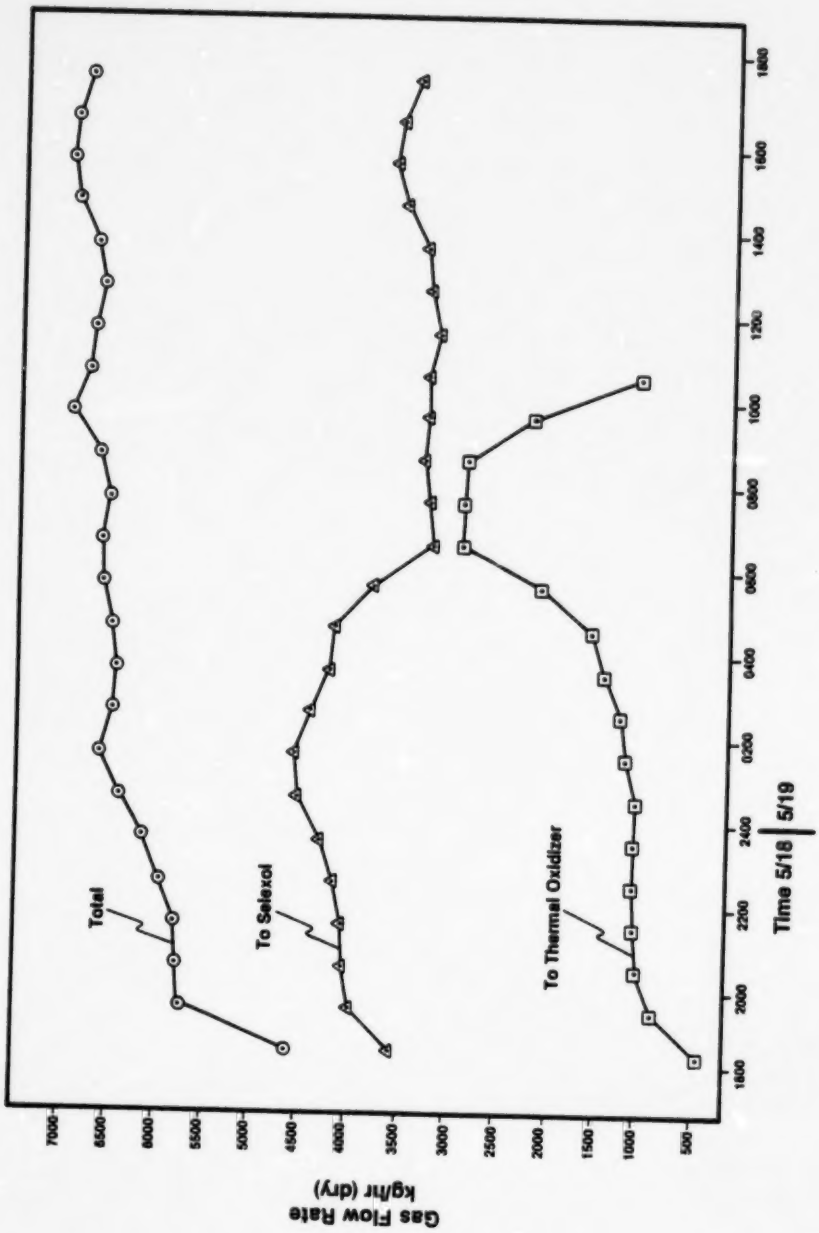


Figure 11. Run 19B, product gas flow rates.

approximated steady state. Two periods during Run 19A, designated A_1 (April 21, 1982, 1000 hours to 2200 hours) and A_2 (April 22, 1982, 0200 hours to 1400 hours) were evaluated independently.

The mass flow accountability data shown in Table 4 for the two steady periods during Run 19A are calculated from the compositional and flow data given in Appendix B. Since rigorous mass balance was not the test objective, sampling and data collection were not conducted with the degree of time phasing and measurement frequency required to insure balance closure. The data available from each of the two steady periods during Run 19A were used to calculate average gas flow rate and compositions. The average mass flows for individual components were calculated from these period averages. No attempt was made to force balance closure by selection of "best fit" data. The mass balances calculated during these periods show a high degree of material accountability.

The information provided in Table 4 is the mean mass flow rate in and out of the Selexol unit for each specie and the associated standard error. The standard error takes into account the uncertainties associated with the analytical measurement and the flow measurement. The "out" column includes both the Selexol absorber outlet plus the acid gas stream. The acid gas flow rate for Period A_2 has been assumed to be equivalent to the Period A_1 acid gas flow rate. Since the acid gas flow rate for Period A_2 is based on this assumption, a 15% standard deviation was used for error propagation for this stream.

Process GC data were not available for acid gas composition or Selexol absorber inlet COS concentrations. Instead, manual GC analyses consisting typically of two data points were used. A 20 percent standard deviation estimate was used for error propagation of these compositional data.

TABLE 4. BI-GAS RUN 19A: SELEXOL MASS FLOW ACCOUNTABILITY BALANCE

Specie	Period A_1: 4/21/82 1000-2200 Hours			Period A_2: 4/22/82 0200-1400 Hours		
	In*	Out*	O/I x 100%	In*	Out*	O/I x 100%
H_2S	39.6 ± 6.3	54.1 ± 11	137	41.0 ± 2.4	48.8 ± 12	119
H_2	220 ± 15	240 ± 13	109	224 ± 13	220 ± 18	98
CO_2	1840 ± 150	1950 ± 120	106	1800 ± 100	1910 ± 160	106
N_2	520 ± 66	514 ± 58	99	529 ± 42	486 ± 49	92
CH_4	397 ± 37	406 ± 43	102	399 ± 28	384 ± 37	96
CO	2530 ± 120	2490 ± 290	98	2590 ± 150	2400 ± 194	93
COS	3.43 ± 0.7	7.84 ± 1.3	228	Not Available	3.4 ± 0.4	--
TOTAL GAS	5550 ± 210	5660 ± 320	102	5580 ± 190	5450 ± 260	98

*kg/hr

Data shown takes into account the uncertainty associated with the analytical measurement and the uncertainty associated with the flow measurement. The acid gas flow rate for Period A_2 is assumed to be equal to Period A_1. Since the acid gas flow rate for Period A_2 is based on an assumption, a 15% standard deviation was used for error propagation for this stream. Acid gas process GC data and Period A_1 inlet COS data were not available. Instead, manual GC analyses consisting typically of two data points were used. A 20% standard deviation was used for error propagation for acid gas compositional data.

Error estimates were calculated using the following equations:

1. $$Ep = \sqrt{(\overline{X}S_{\overline{y}})^2 + (\overline{Y}S_{\overline{x}})^2 + (S_{\overline{y}}S_{\overline{x}})^2}$$

where

Ep = error estimate for results which are products of two means, each with associated standard deviations (kg/hr)

$\overline{X}$ = mean total mass flow rate (kg/hr)

$S_{\overline{x}}$ = standard deviation of $\overline{x}$ (kg/hr)

$\overline{Y}$ = mean proportion of $\overline{X}$ accounted for by a component (dimensionless)

$S_{\overline{y}}$ = standard deviation of $\overline{Y}$ (dimensionless)

2. $$E_{sum} = \sqrt{\sum_{n=1}^{j} Ep_n}$$

where

E_{sum} = error estimate for results which are sums of component flow rates (kg/hr)

j = number of individual component values contributing to sums (dimensionless)

Error estimates for the inlet gas stream were based on Equation 1. Error estimates for "total outlet" which is the sum of the acid gas and Selexol outlet were based on both Equations 1 and 2 as were "total gas" error estimates.

APPENDIX A

PROCESS GC DATA

This Appendix contains the process gas chromatographic data from test periods 19A and 19B conducted at the Bi-Gas Pilot Plant in April and May of 1982. Also included are the instrument calibration data.

Instruments were calibrated against certified gas standards before, during, and after each test. Results of the calibration verifications for the major gas components are presented in Tables A-1 and A-2. In general, all the calibration checks correspond to the actual calibration values within an absolute ±1%. Calibration verifications for hydrocarbon analyses are listed in Table A-3. Typical calibration curves for H_2S and COS are shown in Figures A-1 and A-2. Only two calibration points were used. Due to the non-linearity of flame photometric detectors, three calibration points would be better; however, most of the analyses fall between the two calibration standards. Response precision over the test period was within ±2%.

Table A-4 presents data from Run 19A for the Selexol inlet and outlet gas streams. Table A-5 contains data for the Selexol inlet and acid gas streams that was collected during Run 19B. The data are presented as they were recorded by the data logging system and have not been edited to reflect appropriate significant figures.

TABLE A-1. CALIBRATION VERIFICATION FOR APPLIED AUTOMATION TCD

	Date:	4-20-82	4-20-82	4-21-82	4-22-82	4-22-82	5-18-82	5-19-82	5-19-82	5-19-82
	Time:	1418	1429	1543	0815	0836	1754	0902	0909	0928
Specie	Calibration Standard (%)									
H_2	45.9 ±.1	45.4	45.7	45.9	45.5	46.5	45.4	45.0	43.3	43.5
CO_2	7.01 ±.07	6.8	6.6	6.5	5.9	5.9	7.8	7.2	7.3	6.9
N_2	4.00 ±.04	4.1	4.1	4.2	4.2	4.1	4.0	4.2	5.8	4.1
CH_4	7.01 ±.07	7.1	7.1	7.0	7.1	7.0	7.0	7.2	7.3	7.3
CO	36.0 ±.1	36.6	36.5	36.4	36.4	36.5	35.8	36.7	36.7	36.7

	Date:	4-21-82	4-21-82	4-21-82	4-22-82	5-18-82	5-19-82	5-19-82
	Time:	0828	1513	1521	0753	1801	0836	0848
Specie	Calibration Standard (%)							
H_2	35.9 ±.1	36.1	38.8	36.4	35.8	35.5	34.6	36.0
CO_2	23.0 ±.1	23.1	22.8	22.4	23.0	23.0	23.1	22.1
N_2	6.01 ±.06	6.0	6.1	6.1	6.0	6.0	6.5	5.4
CH_4	13.0 ±.1	12.9	13.0	13.0	13.1	13.3	13.5	13.8
CO	22.0 ±.1	21.9	19.4	22.1	22.0	22.1	22.4	22.8

TABLE A-2. CALIBRATION VERIFICATION, BENDIX TCD

	Date:	4-21-82	4-21-82	4-22-82	4-22-82
	Time:	1606	1619	0815	0836
Species	Calibration Standard (%)				
H_2	45.9 ±.1	46.6	45.5	45.0	44.5
CO_2	7.01 ±.07	7.7	7.6	7.8	7.8
N_2	4.00 ±.04	4.0	4.1	4.1	4.1
CH_4	7.01 ±.07	6.8	6.9	7.0	7.1
CO	36.1 ±.1	34.9	35.9	36.1	36.4

	Date:	4-21-82	4-21-82	4-21-82	4-22-82
	Time:	0806	1555	1546	0753
Species	Calibration Standard (%)				
H_2	35.9 ±.1	34.4	35.9	36.1	38.0
CO_2	23.0 ±.1	23.2	23.3	23.3	22.7
N_2	6.01 ±.06	6.2	5.9	5.9	5.8
CH_4	13.0 ±.1	13.5	13.0	12.9	12.5
CO	22.0 ±.1	22.7	21.9	21.8	21.1

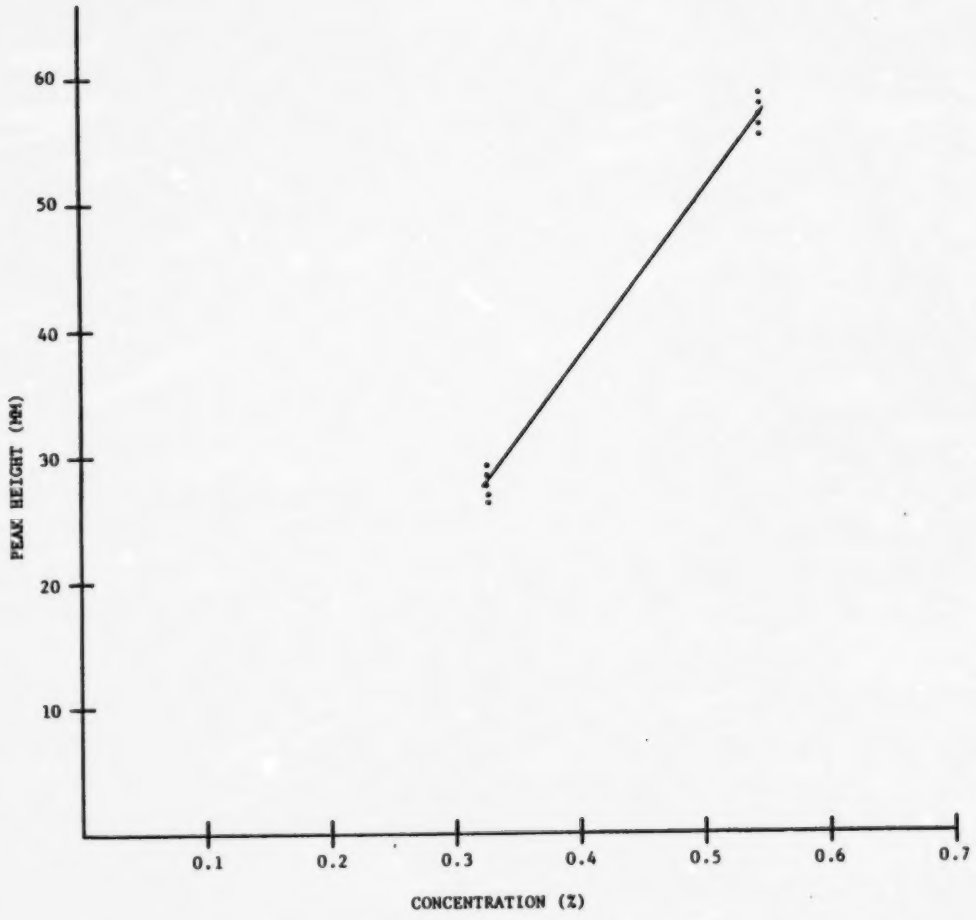


Figure A-1. H_2S calibration curve, AA-FPD.

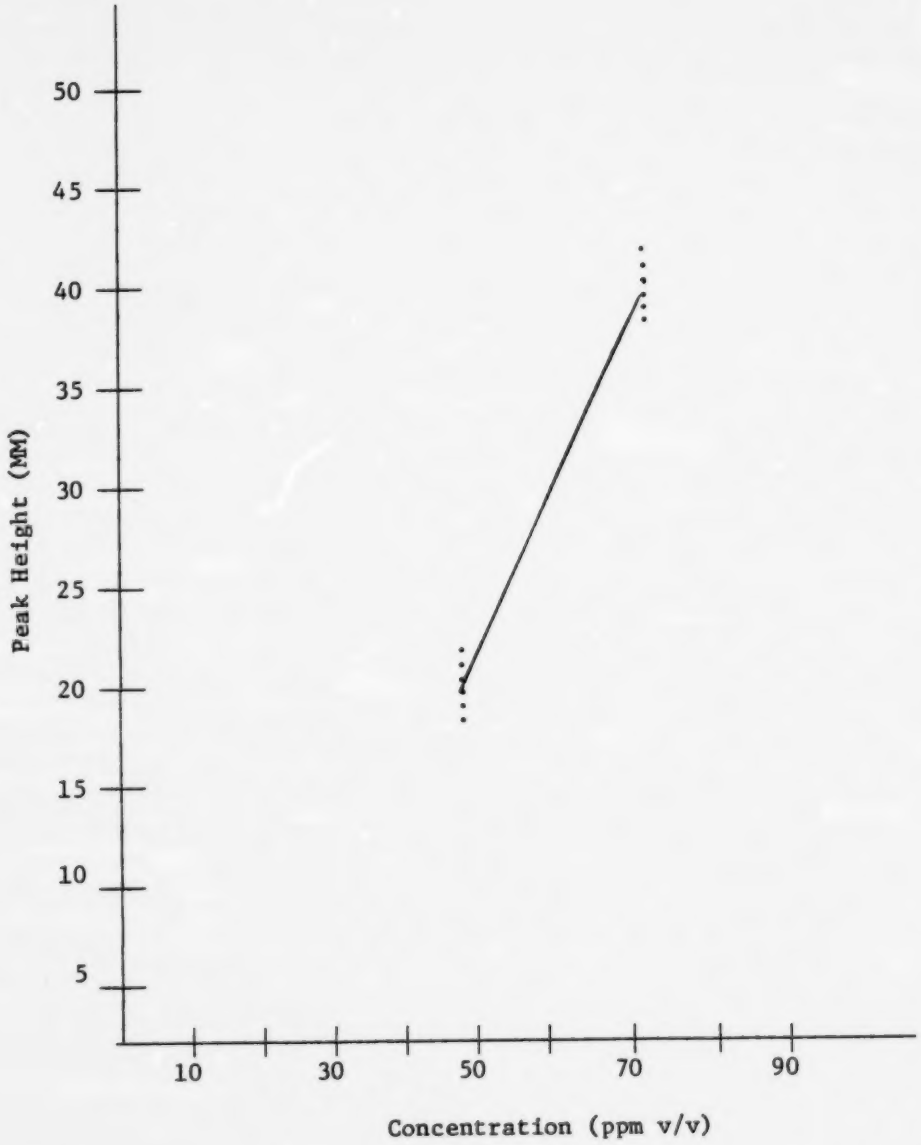


Figure A-2. COS calibration curve - Bendix FPD.

TABLE A-3. CALIBRATION VERIFICATION, AA FID

	Date:	4-20-82	4-20-82	4-20-83	4-20-82	4-21-82	4-21-82
	Time:	0821	0841	0904	1454	0916	1641
Specie	Calibration Standard (ppm v/v)						
C_2H_6	1090	1095	1101				
C_4+	3030	3042	3028				
C_2H_6	112			100	102	117	117
C_4+	285			288	287	264	343

TABLE A-4. DATA FROM RUN 19A FOR THE SELEXOL ABSORBER INLET AND OUTLET

Selexol Absorber Inlet Run 19A

4-21-82	0800	0810	0820	0830	0840	0850	Hourly Average	0900	0910	0920	0930	0940	0950	Hourly Average	1000	1010	1020	1030	1040	1050	Hourly Average
H_2S (%)										.41	.67	.64	.55	.57 ±.12	.46	.47	.46	.46	.42	.43	.45 ±.02
C_2H_6 (ppm)					42	40	41 ±1	40	45	36	37	36	38	39 ±4	38	37	40	42		35	38 ±3
C_4+ (ppm)					1468	1550	1509 ±58	1465	1450	1194	1338	1377	1248	1345 ±108	1248	1284	1119	1349		1317	1263 ±89
H_2 (%)				24.5	23.9	24.4	24.3 ±.3	21.8	28.1	29.2	28.4	28.6	29.2	27.6 ±2.8	28.7	28.5	30.1	30.3	39.3	39.5	32.7 ±5.2
CO_2 (%)				19.6	20.1	19.5	19.7 ±.3	20.1	18.7	18.2	18.6	18.2	18.3	18.7 ±.7	18.2	18.3	17.9	17.9	15.7	15.3	17.2 ±1.3
N_2 (%)				10.8	10.7	10.2	10.6 ±.3	10.3	9.6	9.3	9.4	9.0	9.1	9.4 ±.5	9.1	9.1	8.6	8.7	7.6	7.4	8.4 ±.7
CH_4 (%)				9.9	9.8	9.6	9.8 ±.2	9.9	9.1	8.9	9.3	9.2	9.0	9.2 ±.4	9.3	9.4	9.2	9.2	8.0	7.8	8.8 ±.7
CO (%)				35.2	35.5	36.3	35.7 ±.6	37.9	34.5	34.4	34.3	35.0	34.4	35.0 ±1.4	34.7	34.7	34.2	33.9	29.4	30.0	32.8 ±2.4

Selexol Absorber Outlet Run 19A

4-21-82	0800	0810	0820	0830	0840	0850	Hourly Average	0900	0910	0920	0930	0940	0950	Hourly Average	1000	1010	1020	1030	1040	1050	Hourly Average
H_2S (ppm)							<4							<4							<4
COS (ppm)			71	72	73	73	72 ± 1	73	74	74	74	74	75	74 ± 1	74	74	74	75	59	66	70 ± 6
H_2 (%)			43.3	40.7	40.2	40.7	41.2 ±1.4	41.2	40.1	40.3	40.3	40.4	40.5	40.5 ±.4	40.2	39.9	40.9	39.9	39.5		40.1 ±.5
CO_2 (%)			11.6	15.4	15.4	15.3	14.4 ±1.8	15.2	15.3	15.4	15.1	15.2	15.1	15.2 ±.1	15.3	15.2	15.3	15.3	15.2		15.3 ±.1
N_2 (%)			8.9	8.3	8.5	8.5	8.6 ±.2	8.3	8.2	8.3	7.9	8.0	7.8	8.0 ±.4	7.8	7.7	7.8	7.6	7.8		7.7 ±.1
CH_4 (%)			7.3	7.4	7.6	7.4	7.4 ±.1	7.5	7.4	7.5	7.6	7.5	7.6	7.5 ±.1	7.6	7.7	7.9	7.7	7.8		7.7 ±.1
CO (%)			28.9	28.2	28.3	28.1	28.4 ±.4	28.8	29.0	28.5	29.1	28.9	29.0	28.9 ±.2	29.1	29.5	29.1	29.5	29.7		29.4 ±.3

TABLE A-4. (Continued)

Selexol Absorber Inlet Run 19A

4-21-82	1100	1110	1120	1130	1140	1150	Hourly Average	1200	1210	1220	1230	1240	1250	Hourly Average	1300	1310	1320	1330	1340	1350	Hourly Average
H_2S (%)	.28	.26	.19	.18	.17	.39	.25 ±.08	.39	.39	.40	.39	.40	.40	.39 ±.01	.40	.40	.40	.40	.40	.40	.40 ±0
C_2H_6 (ppm)	36	<20	<20	<20	33	31	26 ±8	35	31	35		34	34	34 ±2	34	33	34	34	33	31	33 ±1
C_4+ (ppm)	1363	909	196	216	1106	1194	831 ±505	1179	1166	1259		1171	1274	1210 ±52	1264	1154	1277	1196	1132	1099	1187 ±72
H_2 (%)	40.1	41.0	39.2	39.4			39.9 ±.8	39.1	39.1	39.1	39.1	39.0	38.8	39.0 ±.1	38.8	38.9	38.5	38.9	38.9	39.0	38.8 ±.2
CO_2 (%)	15.1	14.9	15.2	15.3			15.1 ±.2	15.1	15.4	15.3	15.1	15.2	15.3	15.2 ±.1	15.4	15.4	15.4	15.4	15.4	15.4	15.4 ±0
N_2 (%)	7.4	7.2	7.2	7.2			7.3 ±.1	7.1	7.1	7.1	7.1	7.2	6.9	7.0 ±.1	7.0	6.8	7.0	6.9	6.6	6.7	6.8 ±.2
CH_4 (%)	7.7	7.6	8.1	7.9			7.8 ±.2	7.9	8.1	8.1	8.1	8.0	8.1	8.1 ±.1	8.0	8.1	8.4	8.0	8.1	8.1	8.1 ±.2
CO (%)	29.7	29.3	30.3	30.0			29.8 ±.4	30.8	30.3	30.4	30.6	30.6	30.9	30.6 ±.2	30.8	30.8	30.7	30.8	30.0	30.8	30.6 ±.3

Selexol Absorber Outlet Run 19A

4-21-82	1100	1110	1120	1130	1140	1150	Hourly Average	1200	1210	1220	1230	1240	1250	Hourly Average	1300	1310	1320	1330	1340	1350	Hourly Average
H_2S (ppm)							<4							<4							<4
COS (ppm)	73	71	75	76	76	76	75 ± 2	76	76	76	76	76	88	78 ± 5	71					77	74 ± 3
H_2 (%)					40.3	40.4	40.3 ±.1	40.5	40.1	40.3	40.0	39.9	40.1	40.1 ±.2						40.2	40.2
CO_2 (%)					15.0	15.0	15.0 ±0	15.0	15.0	15.0	14.9	14.9	14.9	15.0 ±.1						14.6	14.6
N_2 (%)					7.2	7.2	7.2 ±0	7.1	7.0	7.0	7.4	7.1	7.1	7.2 ±.2						6.7	6.7
CH_4 (%)					7.9	7.8	7.8 ±.1	7.7	7.7	7.9	7.9	8.0	7.9	7.8 ±.1						7.9	7.9
CO (%)					29.6	29.6	29.6 ±0	29.7	30.2	29.8	29.8	30.1	30.0	29.9 ±.2						30.6	30.6

TABLE A-4. (Continued)

Selexol Absorber Inlet Run 19A

4-21-82	1400	1410	1420	1430	1440	1450	Hourly Average	1500	1510	1520	1530	1540	1550	Hourly Average	1600	1610	1620	1630	1640	1650	Hourly Average
H_2S (%)	.39	.40	.39	.39	.40	.39	.39 ±.01	.40	.41	.41	.41	.42		.41 ±.01							
C_2H_6 (ppm)	34	32	37	35	34	34	34 ±2	33	35	33	33	36	39	35 ±2							
C_4+ (ppm)	1178	1207	1298	1248	1154	1235	1220 ±52	1099	1201	1226	1213	1285	1496	1253 ±133							
H_2 (%)															39.5	39.6	40.1	38.9	38.3	37.0	38.9 ±1.1
CO_2 (%)															15.1	15.0	15.0	14.4	14.1	14.0	14.6 ±.5
N_2 (%)															6.5	6.5	6.7	6.3	6.1	6.3	6.4 ±.2
CH_4 (%)															9.1	9.0	8.2	9.4	9.5	9.5	9.1 ±.5
CO (%)															29.8	29.9	30.0	31.0	32.0	32.2	30.8 ±1.1

Selexol Absorber Outlet Run 19A

4-21-82	1400	1410	1420	1430	1440	1450	Hourly Average	1500	1510	1520	1530	1540	1550	Hourly Average	1600	1610	1620	1630	1640	1650	Hourly Average
H_2S (ppm)							<4							<4							<4
COS (ppm)	76	77	67	77	77	77	75 ± 4	77	77	77				77 ± 0				75	77	82	78 ± 3
H_2 (%)	41.1	45.9	45.4	45.6	45.7	45.5	44.9 ±1.8	45.4	45.4					45.4 ±0	43.0	41.4	40.4	40.3			41.3 ±1.3
CO_2 (%)	14.6	13.3	13.5	13.5	13.3	13.3	13.5 ±.5	13.3	13.3					13.3 ±0	13.8	13.7	13.6	13.1			13.6 ±.3
N_2 (%)	6.7	6.2	6.1	6.1	6.0	6.1	6.2 ±.3	5.9	6.0					6.0 ±.1	6.4	6.2	5.9	6.1			6.1 ±.2
CH_4 (%)	7.9	7.1	7.4	7.3	7.3	7.4	7.4 ±.3	7.4	7.4					7.4 ±0	7.6	8.9	9.1	9.2			8.7 ±.7
CO (%)	29.7	27.5	27.6	27.5	27.7	27.7	28.0 ±.9	28.0	27.9					27.9 ±.1	29.2	29.8	31.0	31.3			30.3 ±1.0

TABLE A-4. (Continued)

Selexol Absorber Inlet Run 19A

4-21-82	1700	1710	1720	1730	1740	1750	Hourly Average	1800	1810	1820	1830	1840	1850	Hourly Average	1900	1910	1920	1930	1940	1950	Hourly Average
H_2S (%)					.43	.43	.43 ±0	.41	.32	.41	.55	.45	.43	.43 ±.07	.43	.42	.43	.43	.44	.43	.43 ±.01
C_2H_6 (ppm)	39	44	44	43	44	46	44 ±2	34	39	<20	<20	96	40	41 ±28	43	38	35	33	38	44	39 ±4
C_4+ (ppm)	1198	1290	1836	1401	1500	1419	1440 ±220	1223	1171	467	380	3661	1345	1374 ±1192	1757	1197	890	823	701	994	1060 ±380
H_2 (%)	38.6	38.6	38.5	39.5	38.1	37.8	38.5 ±.6	38.6	38.6	40.2	41.7	39.2	39.3	39.6 ±1.2	38.3	39.0	38.9	39.4	38.2	38.2	38.7 ±.5
CO_2 (%)	14.2	14.1	14.2	14.2	14.0	13.8	14.1 ±.2	14.2	13.9	14.7	15.6	13.8	13.3	14.2 ±.8	13.6	14.0	14.0	13.3	13.9	13.8	13.8 ±.3
N_2 (%)	6.2	6.1	6.3	6.2	5.9	6.0	6.1 ±.2	6.1	6.1	6.1	6.2	5.6	5.9	6.0 ±.2	5.8	6.1	5.8	6.0	5.9	5.9	5.9 ±.1
CH_4 (%)	9.5	9.6	9.5	8.8	9.5	9.5	8.9 ±1.2	9.2	9.2	8.3	7.3	10.6	8.7	8.9 ±1.1	9.4	9.0	9.1	8.3	9.3	9.6	9.1 ±.5
CO (%)	31.5	31.6	31.5	31.3	32.5	32.9	31.9 ±.7	32.0	32.2	30.7	29.2	30.8	32.9	31.3 ±1.3	32.9	31.9	32.2	33.0	32.7	32.5	32.5 ±.4

Selexol Absorber Outlet Run 19A

4-21-82	1700	1710	1720	1730	1740	1750	Hourly Average	1800	1810	1820	1830	1840	1850	Hourly Average	1900	1910	1920	1930	1940	1950	Hourly Average
H_2S (ppm)							<4							<4							<4
COS (ppm)	82	80	84	79	82	84	82 ± 2	84	82	83	71	70	75	78 ± 6	94	84	82	82	77	79	83 ± 5
H_2 (%)	40.6	40.4	40.2	41.0	39.7	39.2	40.2 ±.6	39.9	40.0	42.4	44.1	40.5	40.3	41.2 ±1.7	39.4					39.7	39.6 ±.2
CO_2 (%)	13.2	13.6	13.5	13.4	13.8	13.6	13.5 ±.2	13.7	13.4	12.4	14.2	13.9	13.0	13.4 ±.6	13.5					13.3	13.4 ±.1
N_2 (%)	6.1	5.9	6.1	6.1	5.7	5.9	6.0 ±.2	6.0	6.0	6.0	6.2	5.4	5.6	5.9 ±.3	5.6					5.7	5.7 ±.1
CH_4 (%)	9.2	9.2	9.3	8.7	9.1	9.2	9.1 ±.2	9.0	9.1	7.6	6.1	9.9	8.8	8.4 ±1.3	9.2					9.2	9.2 ±0
CO (%)	30.9	30.9	30.9	30.8	31.7	32.1	31.2 ±.5	31.4	31.5	31.6	29.4	30.3	32.3	31.2 ±1.1	32.3					32.1	32.2 ±.1

TABLE A-4. (Continued)

Selexol Absorber Inlet Run 19A

4-21-82	2000	2010	2020	2030	2040	2050	Hourly Average	2100	2110	2120	2130	2140	2150	Hourly Average	2200	2210	2220	2230	2240	2250	Hourly Average
H_2S (%)	.43	.43	.42	.43	.44	.44	.43 ±.01	.44	.44	.44	.43	.45	.45	.44 ±.01	.45	.43	.45	.38	.41	.52	.44 ±.04
C_2H_6 (ppm)	45	37	35	44	40	42	41 ±4	42	39	41	39	34	41	39 ±4	43	44	46	44	26	23	38 ±10
C_4+ (ppm)	1204	776	1006	1196	1343	1235	1127 ±112	1210	980	1025	1119	971	1173	1079 ±102	1136	1083	1229	1225	607	376	943 ±361
H_2 (%)	38.3	40.2	38.9	39.0	39.7	39.5	39.3 ±.7	39.1	39.9	38.6	39.2	39.1	38.7	39.1 ±.5	38.7	38.4	38.9	39.0	39.2	42.0	39.4 ±1.3
CO_2 (%)	13.7	13.5	13.7	13.9	14.1	13.9	13.6 ±.2	13.9	13.5	13.8	14.4	14.0	13.7	13.9 ±.3	13.8	13.6	13.9	13.7	13.6	13.9	13.8 ±.1
N_2 (%)	6.0	6.0	6.0	6.0	6.1	6.0	6.0 ± .1	6.0	5.8	5.9	6.1	5.9	5.8	5.9 ±.1	5.9	5.8	5.9	5.8	5.8	5.9	5.8 ±.1
CH_4 (%)	9.6	7.9	9.2	9.3	8.6	8.5	8.8 ±.6	8.8	7.9	8.8	8.9	8.9	9.3	8.8 ±.5	9.2	9.3	9.1	8.9	8.8	5.8	8.5 ±1.3
CO (%)	32.4	32.4	32.2	31.8	31.5	32.1	32.1 ±.4	32.2	32.9	32.9	31.4	32.1	32.5	32.3 ±.6	32.4	32.9	32.2	32.6	32.6	32.4	32.5 ±.2

Selexol Absorber Outlet Run 19A

4-21-82	2000	2010	2020	2030	2040	2050	Hourly Average	2100	2110	2120	2130	2140	2150	Hourly Average	2200	2210	2220	2230	2240	2250	Hourly Average
H_2S (ppm)							<4							<4							<4
COS (ppm)	82	82	81	79	78	78	80 ± 2	79	79	81	81	81	80	80 ± 1	81	82	84	85	84	82	83 ± 1
H_2 (%)	39.3	41.3	40.0	40.3	41.1	40.5	40.4 ±.7	40.2	40.6	40.0	41.0	40.6	40.4	40.5 ±.4	40.5	40.0	40.7	40.6	40.9	43.9	41.1 ±1.4
CO_2 (%)	13.4	13.2	13.2	13.4	13.6	13.6	13.4 ±.2	13.4	13.6	13.3	13.5	13.6	13.4	13.5 ±.1	13.4	13.1	13.3	13.5	12.9	12.7	13.1 ±.3
N_2 (%)	5.8	5.7	5.8	5.8	5.9	5.7	5.8 ±.1	5.8	5.6	5.6	5.8	5.6	5.6	5.7 ±.1	5.6	5.6	5.6	5.5	5.6	5.7	5.6 ±.1
CH_4 (%)	9.5	7.9	9.2	9.1	8.3	8.6	8.8 ±.6	8.7	8.1	8.5	8.7	8.8	9.0	8.6 ±.3	9.0	9.1	8.7	8.6	8.6	5.8	8.3 ±1.2
CO (%)	32.0	31.8	31.8	31.4	31.1	31.6	31.6 ±.3	31.9	32.1	32.6	31.0	31.4	31.6	31.8 ±.6	31.5	32.2	31.7	31.8	32.0	31.9	31.9 ±.2

TABLE A-4. (Continued)

Selexol Absorber Inlet Run 19A

4-21-82	2300	2310	2320	2330	2340	2350	Hourly Average	0000	0010	0020	0030	0040	0050	Hourly Average	0100	0110	0120	0130	0140	0150	Hourly Average
H_2S (%)	.47	.31	.19	.13			.27 ±.15		.30	.25	.30	.36		.30 ±.05	.37	.39	.40	.41	.40	.41	.40 ± 01
C_2H_6 (ppm)	49	45	28	<20	<20		32 ±14	<20	44	<20	<20	38		29 ±12	30	37	33	38	31	41	35 ±4
C_4+ (ppm)	1289	2131	644	140	42		849 ±870	50	572	414	333	449		443 ±86	534	990	833	1422	995	1476	1042 ±358
H_2 (%)	40.7	37.0	38.4	42.9	44.2	47.4	41.8 ±3.8	48.7	40.8	41.7	40.2			42.8 ±3.9	39.5	39.7	39.9	39.7	39.8	38.8	39.6 ±.4
CO_2 (%)	14.2	13.3	13.2	15.3	18.3	19.4	15.6 ±2.6	20.1	16.8	15.6	15.7			17.1 ±2.1	15.0	15.0	15.6	14.8	14.6	14.5	14.9 ±.4
N_2 (%)	5.9	6.1	5.6	7.0	7.5	8.4	6.7 ±1.1	11.2	9.1	8.7	8.3			9.3 ±1.3	7.8	7.5	7.4	7.4	7.4	7.2	7.4 ±.2
CH_4 (%)	7.9	11.9	9.5	4.0	3.5	2.4	6.5 ±3.8	1.1	9.1	6.9	8.0			6.3 ±3.6	8.3	8.8	8.1	8.7	8.3	9.2	8.6 ±.4
CO (%)	31.3	31.7	33.3	30.8	26.5	22.4	29.3 ±4.1	18.9	24.2	27.1	27.8			24.5 ±4.0	29.4	29.0	30.0	29.4	29.9	30.3	29.7 ±.5

Selexol Absorber Outlet Run 19A

4-21-82	2300	2310	2320	2330	2340	2350	Hourly Average	0000	0010	0020	0030	0040	0050	Hourly Average	0100	0110	0120	0130	0140	0150	Hourly Average
H_2S (ppm)							< 4							< 4							< 4
COS (ppm)	85	74	74	93	78	64	78 ± 9	41	39	43				41 ± 2	48	50	59	64	65	69	59 ± 8
H_2 (%)	42.0	38.4	40.2	46.4	47.6		42.9 ±4	51.9	52.4	42.3	43.6	42.8		46.6 ±5.1	40.7	41.6	41.7	41.2	41.9	41.4	41.4 ±.4
CO_2 (%)	14.0	13.1	12.6	10.7	13.1		12.7 ±1.2	16.0	16.8	16.6	14.8	15.0		15.8 ±.9	14.9	14.2	14.2	13.8	13.9	13.8	14.1 ±.4
N_2 (%)	5.6	5.7	5.5	6.7	7.4		6.2 ±.8	10.2	11.3	8.6	8.9	8.6		9.5 ±1.2	7.8	7.7	7.1	7.1	6.6	7.0	7.2 ±.4
CH_4 (%)	8.1	11.7	9.2	4.0	3.5		7.3 ±3.5	1.3	1.1	8.0	6.1	6.8		4.6 ±3.2	8.2	8.0	7.5	8.2	7.4	8.4	8.0 ±.4
CO (%)	30.3	31.1	32.5	32.2	28.4		30.9 ±1.6	20.5	18.4	24.5	26.6	26.8		23.4 ±3.7	28.4	28.5	29.5	29.7	30.2	29.4	29.3 ±.7

TABLE A-4. (Continued)

Selexol Absorber Inlet Run 19A

4-22-82	0200	0210	0220	0230	0240	0250	Hourly Average	0300	0310	0320	0330	0340	0350	Hourly Average	0400	0410	0420	0430	0440	0450	Hourly Average
H_2S (%)	.40	.40	.41	.41	.41	.42	.41 ±.01	.42	.41	.41	.41	.41	.41	.41 ±.01	.42	.42	.43	.42	.42	.43	.42 ±.01
C_2H_6 (ppm)	30	38	42	39	33	33	36 ±5	32	36	33	34	31	31	33 ±2	35	33	43	40	39	46	39 ±5
C_4+ (ppm)	968	1065	1088	960	858	1001	990 ±82	1057	1084	902	841	1011	655	925 ±162	1033	1184	1241	1329	1337	1435	1260 ±141
H_2 (%)	39.3	38.6	37.9	38.8	38.6	39.0	38.7 ±.5	38.9	38.6	38.5	38.9	38.9	38.6	38.7 ±.2	38.4	39.0	38.1	38.7	39.0	38.0	38.5 ±.4
CO_2 (%)	14.1	14.4	14.1	14.4	14.3	14.2	14.3 ±.1	14.3	14.3	13.9	13.9	14.2	13.7	14.1 ±.3	14.3	14.1	14.1	14.5	14.0	13.7	14.2 ±.3
N_2 (%)	6.9	7.2	6.9	7.0	7.0	6.9	7.0 ±.1	6.9	6.8	6.6	6.6	6.8	6.6	6.7 ±.1	6.9	6.9	6.8	7.1	6.9	6.5	6.9 ±.2
CH_4 (%)	8.3	8.7	9.0	8.6	8.4	8.4	8.6 ±.2	8.3	8.5	8.3	8.0	8.3	8.0	8.2 ±.2	8.5	8.2	9.0	8.9	8.7	9.3	8.8 ±.4
CO (%)	31.4	31.1	32.1	31.2	31.6	31.5	31.5 ±.4	31.6	31.8	32.7	32.6	31.8	33.1	32.3 ±.6	31.9	31.8	32.0	30.8	31.4	32.5	31.7 ±.6

Selexol Absorber Outlet Run 19A

4-22-82	0200	0210	0220	0230	0240	0250	Hourly Average	0300	0310	0320	0330	0340	0350	Hourly Average	0400	0410	0420	0430	0440	0450	Hourly Average
H_2S (ppm)							<4							<4							<4
COS (ppm)	70	71	74	74	75	78	74 ± 3	77	77	77	77	79	80	78 ± 1	78	78	80	79	78	80	79 ± 1
H_2 (%)	40.5	40.8	39.6	39.4	40.5	40.2	40.2 ±.5	39.9	39.8	39.6	39.7	40.2	39.8	39.8 ±.2	39.7	39.8	40.1	39.8	39.1	40.7	39.9 ±.5
CO_2 (%)	13.8	13.6	13.8	13.7	13.9	13.9	13.8 ±.1	13.8	13.9	13.8	13.6	13.6	13.6	13.7 ±.1	13.4	13.8	13.7	13.7	13.9	13.5	13.7 ±.2
N_2 (%)	6.8	6.6	6.8	6.7	6.6	6.9	6.7 ±.1	6.8	6.6	6.6	6.6	6.6	6.5	6.6 ±.1	6.5	6.7	6.6	6.8	6.7	6.4	6.6 ±.2
CH_4 (%)	8.5	8.1	8.8	8.9	8.0	8.3	8.4 ±.4	8.5	8.4	8.3	8.3	8.0	8.1	8.3 ±.2	8.4	8.5	8.5	8.7	9.4	8.3	8.6 ±.4
CO (%)	30.4	30.9	31.0	31.3	31.0	30.7	30.9 ±.3	31.0	31.3	31.7	31.8	31.6	31.8	31.5 ±.3	32.0	31.2	31.1	31.0	30.9	31.1	31.2 ±.4

TABLE A-4. (Continued)

Selexol Absorber Inlet Run 19A

4-22-82	0500	0510	0520	0530	0540	0550	Hourly Average	0600	0610	0620	0630	0640	0650	Hourly Average	0700	0710	0720	0730	0740	0750	Hourly Average
H_2S (%)	.43	.43	.42	.42	.42	.42	.42 ±.01	.42	.42	.42	.42	.42	.42	.42 ±.0	.43	.42	.39	.43			.42 ±.02
C_2H_6 (ppm)	41	43	35	33	30	34	36 ±5	33	32	34	40	40	38	36 ±4	35	40	37	37	27		35 ±5
C_4+ (ppm)	1529	1171	1141	914	961	795	1085 ±259	954	919	1079	1397	1368	1109	1138 ±203	1003	1187	1095	1189	657		1024 ±219
H_2 (%)	38.2	38.2	38.3	39.0	38.9	38.7	38.6 ±.4	39.2	39.5	38.7	38.7	39.0	39.1	39.0 ±.3	38.8	39.0	38.6	38.6	39.7		38.9 ±.5
CO_2 (%)	13.6	14.2	14.3	14.6	13.8	13.9	14.1 ±.4	14.1	14.1	14.1	14.2	14.4	14.0	14.1 ±.1	13.8	14.3	13.9	14.3	14.1		14.1 ±.2
N_2 (%)	6.7	6.4	6.5	6.3	6.0	6.1	6.3 ±.3	6.2	6.1	6.1	6.2	6.2	6.0	6.1 ±.1	6.1	6.1	6.0	6.0	6.2		6.1 ±.1
CH_4 (%)	9.1	9.0	8.9	8.4	8.4	8.5	8.6 ±.4	8.3	8.3	9.0	9.1	8.9	8.8	8.7 ±.4	9.0	9.0	8.9	8.9	7.7		8.7 ±.6
CO (%)	32.4	32.2	32.0	31.7	32.9	32.8	32.3 ±.5	32.2	32.0	32.1	31.8	31.5	32.1	31.9 ±.3	32.3	31.6	32.6	32.2	32.3		32.2 ±.4

Selexol Absorber Outlet Run 19A

4-22-82	0500	0510	0520	0530	0540	0550	Hourly Average	0600	0610	0620	0630	0640	0650	Hourly Average	0700	0710	0720	0730	0740	0750	Hourly Average
H_2S (ppm)							< 4							< 4							<4
COS (ppm)	80	80	84	83	82	81	82 ± 1	80	81	80	80	80	80	80 ± 0	81	80	81	81	79		80 ± 1
H_2 (%)	39.3	40.3	39.2	40.1	39.8	40.0	39.2 ±1.5	40.0	40.1	40.7	40.0	40.3	40.5	40.3 ±.3	40.0	40.0	40.6	40.2	39.5		40.1 ±.4
CO_2 (%)	13.3	13.2	13.8	13.9	14.2	13.6	13.7 ±.4	13.5	13.8	13.7	13.8	13.9	14.0	13.8 ±.2	13.8	13.5	13.8	13.7	13.9		13.7 ±.2
N_2 (%)	6.7	6.6	6.1	6.3	6.0	6.0	3 ±.3	5.9	6.0	5.8	5.9	6.0	5.9	5.9 ±.1	5.6	6.0	5.9	6.1	5.9		5.7 ±.4
CH_4 (%)	9.0	8.5	8.8	8.6	8.5	8.3	8.6 ±.3	8.3	8.7	8.2	8.9	8.7	8.4	8.5 ±.3	8.8	8.7	8.5	8.1	8.6		8.5 ±.3
CO (%)	31.7	31.4	32.1	31.1	31.5	32.1	31.6 ±.4	32.3	31.4	31.6	31.4	31.1	31.2	31.5 ±.4	31.8	31.8	31.2	31.9	31.1		31.6 ±.4

TABLE A-4. (Continued)

Selexol Absorber Inlet Run 19A

4-22-82	0800	0810	0820	0830	0840	0850	Hourly Average	0900	0910	0920	0930	0940	0950	Hourly Average	1000	1010	1020	1030	1040	1050	Hourly Average
H_2S (%)																					
C_2H_6 (ppm)																					
C_4+ (ppm)																					
H_2 (%)					37.8		37.8														
CO_2 (%)					14.7		14.7														
N_2 (%)					5.6		5.6														
CH_4 (%)					10.1		10.1														
CO (%)					31.8		31.8														

Selexol Absorber Outlet Run 19A

4-22-82	0800	0810	0820	0830	0840	0850	Hourly Average	0900	0910	0920	0930	0940	0950	Hourly Average	1000	1010	1020	1030	1040	1050	Hourly Average
H_2S (ppm)							<4							<4							<4
COS (ppm)						96	96	99	86	78	80	79	68	82 ± 9	77	77	75	76	76	75	76± 1
H_2 (%)					39.0	40.0	39.5 ±.1	41.6	40.8	40.7				41.0 ±.5	40.7	41.0	41.4	39.7	39.4	40.0	40.4 ±.8
CO_2 (%)					14.3	14.2	14.2 ±.1	14.6	14.6	14.6				14.6 ±0	14.5	14.8	14.7	14.8	15.2	14.5	14.8 ±.3
N_2 (%)					5.2	5.3	5.3 ±.1	5.5	5.5	5.6				5.5 ±.1	5.6	5.7	5.7	5.7	5.7	6.2	5.8 ±.2
CH_4 (%)					11.2	10.1	10.7 ±.8	8.4	8.5	8.7				8.5 ±.2	8.5	8.8	8.3	8.6	8.6	8.4	8.5 ±.2
CO (%)					30.3	30.4	30.3 ±.1	29.9	30.6	30.4				30.3 ±.4	30.7	29.7	29.9	31.2	31.1	30.9	30.5 ±.6

TABLE A-4. (Continued)

Selexol Absorber Inlet Run 19A

4-22-82	1100	1110	1120	1130	1140	1150	Hourly Average	1200	1210	1220	1230	1240	1250	Hourly Average	1300	1310	1320	1330	1340	1350	Hourly Average
H_2S (%)																					
C_2H_6 (ppm)																					
C_4+ (ppm)																					
H_2 (%)																					
CO_2 (%)																					
N_2 (%)																					
CH_4 (%)																					
CO (%)																					

Selexol Absorber Outlet Run 19A

4-22-82	1100	1110	1120	1130	1140	1150	Hourly Average	1200	1210	1220	1230	1240	1250	Hourly Average	1300	1310	1320	1330	1340	1350	Hourly Average
H_2S (ppm)							< 4							< 4							<4
COS (ppm)	79	81	77	75	73	72	76 ± 3	72	71	70	72	72	70	71 ± 1	69	68	68	69	71	71	69 ± 1
H_2 (%)	39.2	38.9	39.8	39.5	39.7	39.4	39.4 ±.3	39.6	40.2	39.8	39.0	39.2	40.0	39.6 ±.5	40.0	39.2	39.4	39.2	39.3	39.8	39.5 ±.3
CO_2 (%)	14.6	14.7	15.1	15.4	15.3	15.2	15.0 ±.3	15.0	14.3	15.0	14.4	14.5	14.4	14.6 ±.3	14.2	14.6	14.7	15.0	14.7	14.5	14.6 ±.3
N_2 (%)	6.0	6.0	6.2	6.2	6.1	6.0	6.1 ±.1	6.0	6.2	6.2	6.0	6.1	6.2	6.2 ±.1	6.1	6.1	6.1	5.8	6.0	6.3	6.1 ±.2
CH_4 (%)	8.3	8.3	7.9	8.2	8.3	8.3	8.2 ±.2	8.4	8.4	8.4	8.8	8.6	8.3	8.5 ±.2	8.7	9.0	8.8	9.1	8.2	8.4	8.7 ±.4
CO (%)	31.9	32.1	31.0	30.7	30.7	31.1	31.2 ±.6	31.0	30.9	30.6	31.8	31.0	31.1	31.1 ±.4	31.0	31.1	31.0	30.9	31.8	31.0	31.1 ±.3

TABLE A-4. (Continued)

Selexol Absorber Inlet Run 19A

4-22-82	1400	1410	1420	1430	1440	1450	Hourly Average	1500	1510	1520	1530	1540	1550	Hourly Average	1600	1610	1620	1630	1640	1650	Hourly Average
H_2S (%)																					
C_2H_6 (ppm)																					
C_4+ (ppm)																					
H_2 (%)																					
CO_2 (%)																					
N_2 (%)																					
CH_4 (%)																					
CO (%)																					

Selexol Absorber Outlet Run 19A

4-22-82	1400	1410	1420	1430	1440	1450	Hourly Average	1500	1510	1520	1530	1540	1550	Hourly Average	1600	1610	1620	1630	1640	1650	Hourly Average
H_2S (ppm)							<4							<4							<4
COS (ppm)	70	69	69	71	71	69	70 ± 1	66	61	59	51	55	65	60 ± 5							
H_2 (%)	39.4						39.4	41.1	45.3	48.0	38.0	41.0	43.5	42.8 ±3.5	51.0	50.2	50.2	50.1	49.9	50.0	50.2 ±.4
CO_2 (%)	14.5						14.5	13.5	14.8	19.2	17.7	14.5	15.0	15.8 ±2.2	15.7	12.0	12.1	12.2	12.2	12.2	12.7 ±1.5
N_2 (%)	6.2						6.2	6.5	10.2	8.2	6.2	6.4	7.2	7.4 ±1.5	9.1	8.9	8.9	8.9	8.9	8.9	8.9 ±.1
CH_4 (%)	8.8						8.8	7.4	4.2	3.9	8.6	7.0	4.3	5.9 ±2.0	3.3	4.1	4.0	4.0	4.1	4.1	3.9 ±.3
CO (%)	31.1						31.1	31.5	25.5	20.7	29.5	31.1	30.0	28.1 ±4.2	20.9	24.8	24.8	24.8	24.9	24.8	24.2 ±1.6

TABLE A-4. (Continued)

Selexol Absorber Inlet Run 19A

4-22-82	1700	1710	1720	1730	1740	1750	Hourly Average							Hourly Average							Hourly Average
H_2S (%)																					
C_2H_6 (ppm)																					
C_{4+} (ppm)																					
H_2 (%)																					
CO_2 (%)																					
N_2 (%)																					
CH_4 (%)																					
CO (%)																					

Selexol Absorber Outlet Run 19A

4-22-82	1700	1710	1720	1730	1740	1750	Hourly Average							Hourly Average							Hourly Average
H_2S (ppm)							<4														
COS (ppm)																					
H_2 (%)	49.9	49.8	49.8	49.7	49.6		49.7 ±.1														
CO_2 (%)	12.2	12.3	12.4	12.4	12.4		12.3 ±.1														
N_2 (%)	8.9	8.9	8.9	8.9	8.9		8.9 ±0														
CH_4 (%)	4.1	4.1	4.1	4.1	4.2		4.1 ±.1														
CO (%)	24.9	24.9	24.8	24.9	24.9		24.9 ±.1														

TABLE A-5. DATA FROM RUN 19B FOR THE SELEXOL ABSORBER INLET AND ACID GAS STREAMS

Selexol Absorber Inlet Run 19B

5/18/82							Hourly Average							Hourly Average	2000	2010	2020	2030	2040	2050	Hourly Average
H_2S (%)																					
COS (ppm)																					
H_2 (%)																					
CO_2 (%)																					
N_2 (%)																					
CH_4 (%)																					
CO (%)																					

Selexol Acid Gas Run 19B

5/18/82	1800	1810	1820	1830	1840	1850	Hourly Average	1900	1910	1920	1930	1940	1950	Hourly Average							Hourly Average
H_2S (%)					.8	1.6	1.2 ±.6	2.3	4.2	6.5	8.4	8.7		6.0 ±2.7							
CO_2 (%)					63.2	61.8	62.5 ±1.0	59.6	57.1	53.7	52.2	51.0		55.0 ±3.6							
N_2 (%)					23.4	23.2	23.3 ±.1	23.9	24.3	24.5	23.8	23.9		24.1 ±.3							

TABLE A-5. (Continued)

Selexol Absorber Inlet Run 19B

5/18/82	2100	2110	2120	2130	2140	2150	Hourly Average	2200	2210	2220	2230	2240	2250	Hourly Average	2300	2310	2320	2330	2340	2350	Hourly Average
H_2S (%)																					
COS (ppm)																					
H_2 (%)															40.1	39.7	38.7	39.1	39.2	39.1	39.3 ±.5
CO_2 (%)															20.5	20.9	22.4	22.5	20.9	21.0	21.3 ±.9
N_2 (%)															5.4	5.5	5.4	5.3	5.2	5.3	5.3 ±.1
CH_4 (%)															7.6	7.9	7.9	8.1	8.1	8.1	7.9 ±.2
CO (%)															26.4	26.0	26.0	26.5	26.5	26.5	26.3 ±.2

Selexol Acid Gas Run 19B

5/18/82							Hourly Average							Hourly Average	2300	2310	2320	2330	2340	2350	Hourly Average
H_2S (%)																6.2	8.8	8.4	9.2	8.7	8.3 ±1.2
CO_2 (%)																29.4	41.3	36.8	41.7	37.6	37.4 ±4.9
N_2 (%)																20.8	21.6	20.6	22.0	20.1	21.0 ±.8

TABLE A-5. (Continued)

Selexol Absorber Inlet Run 19B

5/19/82	0000	0010	0020	0030	0040	0050	Hourly Average	0100	0110	0120	0130	0140	0150	Hourly Average	0200	0210	0220	0230	0240	0250	Hourly Average
H_2S (%)	•																				
COS (ppm)																					
H_2 (%)	39.0	39.6	38.3	39.0	37.2	38.5	38.6 ±.8	38.8	37.2	37.3	38.7	38.8	38.5	38.2 ±.8	38.5	38.3	38.6	38.7	38.8	38.0	38.4 ±.3
CO_2 (%)	21.3	20.7	22.1	20.5	22.2	22.0	21.5 ±.7	22.1	22.2	22.2	20.7	21.7	20.6	21.5 ±.8	20.8	22.0	22.2	22.2	22.0	20.3	21.5 ±.8
N_2 (%)	5.1	5.2	5.1	5.0	5.2	5.1	5.1 ±.1	5.1	5.1	5.1	5.1	5.0	5.0	5.0 ±.1	5.1	4.9	5.0	5.0	4.9	5.2	5.0 ±.1
CH_4 (%)	8.1	8.0	8.2	7.9	8.0	8.2	8.0 ±.1	7.9	8.3	8.2	8.2	8.1	8.0	8.1 ±.1	8.1	8.0	7.9	7.9	8.0	8.5	8.0 ±.2
CO (%)	26.5	26.5	26.8	27.7	27.4	27.2	27.0 ±.5	27.4	27.2	27.2	27.3	27.5	27.9	27.4 ±.2	27.5	27.9	27.3	27.4	26.3	28.7	27.5 ±.8

Selexol Acid Gas Run 19B

5/19/82	0000	0010	0020	0030	0040	0050	Hourly Average	0100	0110	0120	0130	0140	0150	Hourly Average	0200	0210	0220	0230	0240	0250	Hourly Average
H_2S (%)	8.6	7.6	8.5				8.2 ±.5	10.6				13.9	15.2	13.2 ±2.3	15.3	15.0	14.6	13.9	14.4	14.9	14.7 ±.5
CO_2 (%)	36.2	30.0	39.6				35.3 ±4.9	40.8				55.0	50.3	48.7 ±7.2	53.3	53.5	53.1	50.6	50.2	55.6	53.0 ±2.0
N_2 (%)	19.9	23.4	21.4				21.6 ±1.7	20.7				23.8	24.1	22.9 ±1.9	22.0	22.0	22.8	24.7	24.6	21.1	22.9 ±1.5

TABLE A-5. (Continued)

Selexol Absorber Inlet Run 19B

5/19/82	0300	0310	0320	0330	0340	0350	Hourly Average	0400	0410	0420	0430	0440	0450	Hourly Average	0500	0510	0520	0530	0540	0550	Hourly Average
H_2S (%)															.35	.36	.38	.32	.32	.38	.35 ±.03
COS (ppm)																					
H_2 (%)	39.1	38.9	38.7	38.6	37.1	39.1	38.6 ±.8	37.2	39.3	36.9	36.7			37.5 ±1.2		38.5	38.8	38.9	39.6	38.7	38.9 ±.4
CO_2 (%)	22.0	20.5	21.7	21.9	22.1	22.2	21.7 ±.6	20.7	22.3	20.4	20.5			20.9 ±.9		22.3	22.0	20.4	20.6	21.7	21.4 ±.8
N_2 (%)	5.1	5.1	5.2	5.2	5.0	5.2	5.1 ±.1	5.2	5.2	5.1	5.0			5.1 ±.1		5.0	5.0	5.0	5.0	5.0	5.0 ±0
CH_4 (%)	8.3	8.4	9.1	8.4	8.3	8.3	8.4 ±.3	8.5	8.2	8.5	8.7			8.4 ±.2		8.8	8.6	8.3	7.1	9.3	8.4 ±.8
CO (%)	28.5	28.4	28.0	28.5	28.7	28.5	28.4 ±.2	28.8	28.8	29.0	29.1			28.9 ±.2		29.2	29.2	29.6	29.4	28.8	29.2 ±.3

Selexol Acid Gas Run 19B

5/19/82	0300	0310	0320	0330	0340	0350	Hourly Average	0400	0410	0420	0430	0440	0450	Hourly Average	0500	0510	0520	0530	0540	0550	Hourly Average
H_2S (%)	14.7	14.7	15.1	15.0	14.0	14.1	14.6 ±.5	14.2	16.0	15.4	15.4			15.3 ±.8	15.5	14.9	14.5	14.7	14.7	14.4	14.8 ±.4
CO_2 (%)	52.7	54.4	56.4	54.2	56.0	55.0	55.7 ±1.3	55.6	57.0	54.7	53.8			55.3 ±1.4	53.6	52.4	50.2	50.0	50.3	49.5	51.0 ±1.6
N_2 (%)	23.7	22.5	21.3	23.6	22.5	23.2	23.0 ±.9	22.5	21.4	23.4	24.6			23.0 ±1.4	22.9	21.1	21.0	21.0	20.9	21.1	21.3 ±.8

TABLE A-5. (Continued)

Selexol Absorber Inlet Run 19B

5/19/82	0600	0610	0620	0630	0640	0650	Hourly Average	0700	0710	0720	0730	0740	0750	Hourly Average	0800	0810	0820	0830	0840	0850	Hourly Average
H_2S (%)	.34	.35	.35	.35	.34	.36	.35 ± .01	.36	.36	.35	.35	.35	.35	.35 ± .01	.39	.36	.36	.34	.34	.36	.36 ± .02
COS (ppm)																					
H_2 (%)	39.1	38.7	38.3	36.9	36.9	37.1	37.8 ±1.0	37.2	37.3	38.1	38.0	38.4	38.4	37.9 ± .5	39.0	38.0	38.3				38.4 ± .5
CO_2 (%)	22.1	19.8	20.2	21.6	21.8	21.6	21.1 ± .9	22.1	20.2	21.0	20.7	22.0	20.2	21.0 ± .8	20.2	20.5	20.0				20.2 ± .3
N_2 (%)	5.2	4.9	5.0	5.0	5.0	5.1	5.0 ± .1	5.1	8.3	5.0	7.3	7.4	7.0	6.7 ±1.3	4.8	7.0	8.0				6.6 ± 1.6
CH_4 (%)	8.5	8.4	8.4	8.5	8.8	8.7	8.5 ± .2	8.7	8.8	8.0	8.0	8.0	8.0	8.2 ± .4	9.5	8.0	8.0				8.5 ± .9
CO (%)	28.2	30.7	29.0	29.3	29.1	28.9	29.2 ± .8	28.9	28.9	28.0	28.0	28.0	29.0	28.5 ± .5	29.4	29.0	29.0				29.1 ± .2

Selexol Acid Gas Run 19B

5/19/82	0600	0610	0620	0630	0640	0650	Hourly Average	0700	0710	0720	0730	0740	0750	Hourly Average	0800	0810	0820	0830	0840	0850	Hourly Average
H_2S (%)	14.8	14.0	12.4	11.3	11.3	11.5	12.6 ± 1.5	10.7	11.6	11.5	10.5	10.8	11.6	11.2 ± .5	11.8	11.9	11.3	10.8	10.1		11.2 ± .7
CO_2 (%)	50.4	50.1	51.9	50.2	53.4	51.0	51.2 ±1.3	52.0	52.6	53.3	52.8	53.5	53.2	53.0 ± .6	54.5	54.3	54.1	52.3	53.4		53.7 ± .9
N_2 (%)	20.1	20.8	21.2	22.7	20.9	22.2	21.4 ±1.0	22.0	21.9	21.4	21.9	20.7	20.9	21.5 ± .6	20.3	20.8	20.3	22.2	22.0		21.2 ± .9

TABLE A-5. (Continued)

Selexol Absorber Inlet Run 19B

5/19/82	0900	0910	0920	0930	0940	0950	Hourly Average	1000	1010	1020	1030	1040	1050	Hourly Average	1100	1110	1120	1130	1140	1150	Hourly Average
H_2S (%)	.36	.36	.34	.36	.36		.36 ±.01	.36	.35	.35	.35	.35	.39	.36 ±.02	.42		.36	.36	.37	.38	.38 ±.03
COS (ppm)																					
H_2 (%)				37.0	37.0	36.7	36.9 ±.2	37.1	37.3	37.6	37.4	38.2	38.2	37.6 ±.5	39.2	37.1	37.0	37.6	37.3	37.0	37.5 ±.8
CO_2 (%)				20.3	20.3	20.4	20.3 ±.1	20.4	21.4	20.3	20.3	20.2	20.2	20.4 ±.5	20.0	19.9	19.9	19.9	20.0	19.7	19.9 ±.1
N_2 (%)				5.0	5.5	5.1	5.2 ±.3	5.0	5.0	5.1	5.5	4.9	4.9	5.0 ±.2	4.9	4.8	4.8	4.9	4.7	4.8	4.8 ±.1
CH_4 (%)				8.6	8.8	8.6	8.6 ±.1	8.8	8.4	8.5	8.5	7.7	8.2	8.3 ±.4	7.6	8.6	8.8	8.6	8.7	8.6	8.5 ±.4
CO (%)				29.5	29.0	29.1	29.2 ±.3	29.2	29.3	29.2	29.3	29.3	28.6	29.1 ±.3	28.9	29.6	29.5	29.0	29.3	29.8	29.3 ±.4

Selexol Acid Gas Run 19B

5/19/82							Hourly Average	1000	1010	1020	1030	1040	1050	Hourly Average	1100	1110	1120	1130	1140	1150	Hourly Average
H_2S (%)								10.5	11.6	11.3	10.2	11.0	8.6	10.5 ±1.1	11.0	10.4	10.3	9.6	9.6	9.5	10.0 ±.6
CO_2 (%)								47.2	48.5	50.3	45.0	49.1	31.5	45.3 ±7.0	50.6	47.3	48.5	49.2	48.9	54.2	49.8 ±2.4
N_2 (%)								22.0	19.8	18.6	25.4	20.7	44.8	25.0 ±10.0	18.5	20.0	20.0	19.6	19.4	26.5	18.0 ±8.4

TABLE A-5. (Continued)

Selexol Absorber Inlet Run 19B

5/19/82	1200	1210	1220	1230	1240	1250	Hourly Average	1300	1310	1320	1330	1340	1350	Hourly Average	1400	1410	1420	1430	1440	1450	Hourly Average
H_2S (%)	.37	.37	.38	.35		.36	.37 ±.01	.36	.36	.35	.36	.38	.36	.36 ±.01	.38	.36	.38	.38	.39	.40	.38 ±.01
COS (ppm)																					
H_2 (%)	37.3	37.4	37.6		38.0	37.5	37.5 ±.3	37.8	38.0		37.6	37.7	37.4	37.7 ±.2	36.8	36.8	36.8	36.8	37.0	36.6	36.8 ±.1
CO_2 (%)	19.8	19.6	19.6		19.7	19.5	19.6 ±.1	19.3	19.5		19.7	19.6	19.6	19.5 ±.2	19.4	19.4	19.4	19.4	19.5	19.4	19.4 ±.1
N_2 (%)	4.8	4.8	4.8		4.8	4.7	4.8 ±.1	4.6	4.7		4.8	4.8	4.6	4.7 ±.1	4.7	4.6	4.5	4.5	4.7	4.5	4.6 ±.1
CH_4 (%)	8.7	8.3	8.1		8.3	8.3	8.3 ±.2	7.7	7.8		8.7	8.8	9.2	8.4 ±.7	8.6	9.0	9.7	9.7	10.1	9.0	9.4 ±.6
CO (%)	29.5	29.9	29.7		29.5	30.2	29.8 ±.3	30.9	30.3		29.1	29.4	30.6	30.0 ±.8	30.5	31.0	31.3	31.2	30.3	30.8	30.9 ±.4

Selexol Acid Gas Run 19B

5/19/82	1200	1210	1220	1230	1240	1250	Hourly Average	1300	1310	1320	1330	1340	1350	Hourly Average	1400	1410	1420	1430	1440	1450	Hourly Average
H_2S (%)									11.2					11.2	14.4	14.5	14.8	15.9	15.6		15.0 ±.7
CO_2 (%)									45.0					45.0	58.6	63.3	60.1	62.7	60.0		60.9 ±1.9
N_2 (%)														24.8	25.9	29.4	34.8	28.9	34.0		30.6 ± 3.7

TABLE A-5. (Continued)

Selexol Absorber Inlet Run 19B

5/19/82	1500	1510	1520	1530	1540	1550	Hourly Average	1600	1610	1620	1630	1640	1650	Hourly Average	1700	1710	1720	1730	1740	1750	Hourly Average
H_2S (%)								.39	.40	.41	.40	.41	.37	.40 ±.01	.32	.34	.35	.50	.50	.48	.42 ±.09
COS (ppm)																					
H_2 (%)	37.2	38.0	36.4	36.8	36.3	36.9	36.9 ±.6	36.3	36.2	35.2	36.4	36.1	39.5	36.6 ±1.5	39.1	39.2	38.0	36.9	35.2	36.6	37.5 ±1.5
CO_2 (%)	19.3	19.3	19.5	19.5	19.2	19.3	19.3 ±.1	19.1	19.0	19.0	18.7	18.7	19.9	19.0 ±.4	20.0	20.1	19.6	19.1	18.8	18.7	19.4 ±.6
N_2 (%)	4.5	4.5	4.6	4.6	4.5	4.5	4.5 ±.1	4.5	4.4	4.5	4.4	4.3	4.8	4.5 ±.2	4.8	4.7	4.6	4.4	4.3	4.2	4.5 ±.2
CH_4 (%)	10.0	9.3	9.4	8.9	9.4	8.9	9.3 ±.4	9.7	9.7	10.3	9.8	7.9	5.9	8.9 ±1.7	6.8	7.1	12.1	11.9	12.1	9.3	9.9 ±2.5
CO (%)	32.1	31.5	30.7	31.0	31.4	31.2	31.3 ±.5	31.4	32.1	32.3	32.4	34.0	29.9	32.0 ±1.3	29.1	28.8	28.8	30.6	33.2	34.0	30.8 ±2.3

Selexol Acid Gas Run 19B

5/19/82	1500	1510	1520	1530	1540	1550	Hourly Average	1600	1610	1620	1630	1640	1650	Hourly Average							Hourly Average
H_2S (%)			16.7	16.8	16.7	16.0	16.6 ±.4	16.4	21.2					18.8 ±3.4							
CO_2 (%)			62.1	61.4	60.2	56.6	60.7 ±2.4	60.0	77.7					68.0 ±13							
N_2 (%)			28.8	30.0	33.3	42.0	33.0 ±5.9	33.7	4.0					18.9 ±21							

TABLE A-5. (Continued)

Selexol Absorber Inlet Run 19B

5/19/82	1800	1810	1820	1830	1840	1850	Hourly Average	1900	1910	1920	1930	1940	1950	Hourly Average	2000	2010	2020	2030	2040	2050	Hourly Average
H_2S (%)	.51	.63	.50				.54 ±.07														
COS (ppm)																					
H_2 (%)	35.8	35.7	35.8	36.1	36.1	35.9	35.6 ±.5	36.7	36.6	35.4	35.7	36.2	36.3	36.1 ±.5	35.1	34.8	37.5	40.3	40.2	35.3	37.2 ±2.5
CO_2 (%)	18.6	19.0	19.0	19.1	18.9	18.9	18.9 ±.7	18.8	19.1	19.0	19.0	18.7	19.0	18.9 ±.2	19.1	18.9	19.4	20.1	20.0	19.6	19.5 ±.5
N_2 (%)	4.1	4.3	4.2	4.2	4.2	4.2	4.2 ±.1	4.2	4.2	4.2	4.3	4.1	4.3	4.2 ±.1	4.3	4.2	4.5	4.7	4.6	4.3	4.4 ±.2
CH_4 (%)	10.8	11.3	11.1	11.1	11.0	10.6	11.0 ±.2	10.0	10.5	11.5	10.9	10.4	10.3	10.6 ±.5	10.1	10.4	7.6	6.7	7.5	11.5	8.8 ±2.2
CO (%)	34.2	33.0	33.5	33.1	33.4	33.3	33.4 ±.4	33.8	33.0	33.4	32.7	33.7	33.2	33.3 ±.4	32.6	33.1	31.7	30.0	30.2	30.6	31.4 ±1.3

Selexol Acid Gas Run 19B

							Hourly Average							Hourly Average							Hourly Average
H_2S (%)																					
CO_2 (%)																					
N_2 (%)																					

TABLE A-5. (Continued)

Selexol Absorber Inlet Run 19B

5/19/82	2100	2110	2120	2130	2140	2150	Hourly Average	2200	2210	2220	2230	2240	2250	Hourly Average	2300	2310	2320	2330	2340	2350	Hourly Average
H_2S (%)																					
COS (ppm)																					
H_2 (%)	37.3	33.9	37.2	34.1	35.2	34.5	35.3 ±1.5	34.5	36.1	35.8	35.8	35.4	35.5	36.0 ±.6	35.4	35.7	36.1	36.1	34.9	34.6	35.5 ±.6
CO_2 (%)	18.7	18.7	18.9	18.7	19.2	19.2	18.9 ±.2	19.2	19.3	19.2	19.1	19.0	18.8	19.1 ±.2	19.0	18.9	19.1	18.8	18.8	18.7	18.9 ±.2
N_2 (%)	4.2	4.3	4.4	4.3	4.4	4.3	4.3 ±.1	4.3	4.5	4.3	4.4	4.4	4.4	4.4 ±.1	4.4	4.3	4.4	4.4	4.2	4.2	4.3 ±.1
CH_4 (%)	10.5	11.0	9.6	10.1	11.3	10.5	10.5 ±.6	10.8	11.0	10.9	10.9	10.8	10.6	10.8 ±.1	11.5	11.1	10.6	10.3	11.5	11.0	11.0 ±.5
CO (%)	33.5	34.3	33.3	34.6	33.1	33.1	33.6 ±.6	32.9	32.2	32.3	33.0	32.9	33.6	32.8 ±.5	32.9	33.1	32.4	33.7	33.7	33.9	32.3 ±.6

Selexol Acid Gas Run 19B

							Hourly Average							Hourly Average							Hourly Average
H_2S (%)																					
CO_2 (%)																					
N_2 (%)																					

TABLE A-5. (Continued)

Selexol Absorber Inlet Run 19B

5/20/82	0000	0010	0020	0030	0040	0050	Hourly Average	0100	0110	0120	0130	0140	0150	Hourly Average	0200	0210	0220	0230	0240	0250	Hourly Average
H_2S (%)																					
COS (ppm)																					
H_2 (%)	35.2	35.2	34.5	35.4	34.8	34.6	35.0 ±.4	34.3	36.2	36.3	35.0	34.9	34.8	35.2 ±.8	40.6	37.2	39.0	36.3	39.1	38.5	38.4 ±1.5
CO_2 (%)	18.9	19.1	18.7	19.2	18.7	18.9	18.9 ±.2	19.8	19.8	19.9	18.6	19.7	19.8	19.6 ±.5	19.9	19.8	20.2	20.8	22.6	22.6	20.9 ±1.3
N_2 (%)	4.3	4.4	4.3	4.4	4.3	4.4	4.4 ±.1	4.8	4.6	5.2	4.4	4.7	4.6	4.7 ±.3	4.9	4.8	5.3	5.7	6.1	6.3	5.5 ±.6
CH_4 (%)	11.1	11.6	10.5	11.6	10.8	10.4	11.0 ±.5	12.3	10.7	8.7	11.5	11.0	11.8	11.0 ±1.2	5.7	10.2	8.8	16.4	13.1	14.5	11.4 ±3.9
CO (%)	33.1	32.3	32.9	32.1	33.6	32.9	32.8 ±.5	28.9	29.1	27.7	33.3	29.3	29.0	29.6 ±1.9	31.8	30.0	28.0	22.1	22.1	21.4	25.9 ±5.1

Selexol Acid Gas Run 19B

							Hourly Average							Hourly Average							Hourly Average
H_2S (%)																					
CO_2 (%)																					
N_2 (%)																					

TABLE A-5. (Continued)

Selexol Absorber Inlet Run 19B

5/20/82	0300	0310	0320	0330	0340	0350	Hourly Average							Hourly Average							Hourly Average
H_2S (%)																					
COS (ppm)																					
H_2 (%)	38.2	40.8	44.1	46.2	46.8	32.3	41.4 ±5.5														
CO_2 (%)	22.4	22.5	23.0	23.0	23.0	15.2	21.5 ±3.1														
N_2 (%)	6.4	6.4	7.5	8.8	9.7	18.5	9.4 ±4.6														
CH_4 (%)	13.6	10.7	5.4	4.4	4.7	19.5	9.7 ±6.0														
CO (%)	21.3	21.6	22.4	18.6	18.3	14.4	19.4 ±2.9														

Selexol Acid Gas Run 19B

							Hourly Average							Hourly Average							Hourly Average
H_2S (%)																					
CO_2 (%)																					
N_2 (%)																					

APPENDIX B

MASS BALANCE DATA (RUN 19A)

This Appendix contains the data from which the mass balances were derived. Table B-1 presents the Selexol inlet and outlet flow rate data for two steady-state periods. Average and hourly gas compositional data are presented for periods $19A_1$ and $19A_2$ in Tables B-2 through B-9. All the compositional data presented are from the process GC data except as noted.

TABLE B-1. RUN 19A FLOW RATES - kg/hr DRY GAS BASIS

Period A_1 = 4/21/82 1000-2200 Hrs
(Data is averaged over hour following time noted)

4/21/82	Selexol Absorber Inlet	Selexol Absorber Outlet	Selexol Acid Gas (Reading followed by time of reading)
1000	5672	5540	
1100	5688	5555	
1200	5667	5557	
1300	5650	5546	
1400	5617	5500	270 (1435)
1500	5406	5282	
1600	5481	5390	
1700	5514	5403	258 (1700)
1800	5200	5045	288 (1830)
1900	5574	5409	
2000	5510	5351	264 (2030)
2100	5561	5380	
2200	5416	5236	
$\bar{x}$	5535	5400	270
s	138	150	13.0
s%	2.5	2.8	4.8

Period A_2 = 4/22/82 0200-1400 Hrs

4/22/82	Selexol Absorber Inlet	Selexol Absorber Outlet	Selexol Acid Gas
0200	5579	5326	
0300	5698	5407	No
0400	5560	5283	readings
0500	5805	5442	
0600	5710	5416	Meter not
0700	5528	5222	functioning
0800	5779	5193	
0900	5933	5502	Assumed
1000	5747	5463	A_1
1100	5881	5591	flow
1200	5270	4687	rate
1300	5055	4433	
1400	4947	4418	
$\bar{x}$	5576	5183	
s	308	402	
s%	5.5	7.8	

- Period A_1 O/I* x 100 = 102
- Period A_2 O/I* x 100 = 98

*O/I = $\frac{\text{Selexol Absorber Outlet + Selexol Acid Gas}}{\text{Selexol Absorber Inlet}}$

TABLE B-2. MASS FLOW RATES FOR SELEXOL MAJOR GAS STREAMS
(Run 19A PERIOD A_1, 4/21/82, 1000-2200 Hrs)

Species	Mass Flow (kg/hr) Absorber Inlet	Absorber Outlet	Acid Gas
H_2S	39.6	< 0.040	(54.1)
H_2	220	240	ND
CO_2	1840	1770	(183)
N_2	520	508	(6.45)
CH_4	397	387	(18.9)
CO	2530	2490	ND
COS	3.43	1.36	(6.48)

( ) Manual GC data, 1-3 data points.
ND - not detectable.

	O/I* x 100
H_2S	137
H_2	109
CO_2	106
N_2	99
CH_4	102
CO	98
COS	228

(Supporting data attached in Tables B-3, B-4 and B-5)

$$*O/I = \frac{\text{Selexol Absorber Outlet + Selexol Acid Gas}}{\text{Selexol Absorber Inlet}}$$

TABLE B-3. SELEXOL ABSORBER INLET GAS COMPOSITION
(Run 19A Period A_1, 4/21/82, 1000-2200 Hrs)

	Volume Percent - unless noted						
4/21/82	H_2S	H_2	CO_2	N_2	CH_4	CO	
1000	.45	32.7	17.2	8.4	8.8	32.8	
1100	.25	39.9	15.1	7.3	7.8	29.8	
1200	.39	39.0	15.2	7.0	8.1	30.6	
1300	.40	38.8	15.4	6.8	8.1	30.6	
1400	.39	--	--	--	--	--	<3 det/hr
1500	.41	--	--	--	--	--	<3 det/hr
1600	—	38.9	14.6	6.4	9.1	30.8	
1700	.43	38.5	14.1	6.1	8.9	31.9	
1800	.43	39.6	14.2	6.0	8.9	31.3	
1900	.43	38.7	13.8	5.9	9.1	32.5	
2000	.43	39.3	13.6	6.0	8.8	32.1	
2100	.44	39.1	13.9	5.9	8.8	32.3	
2200	.44	39.4	13.8	5.8	8.5	32.5	
$\bar{x}$**	0.407	38.50	14.64	6.50	8.70	31.63	$\overline{MW}$ = 19.39
s**	0.064	2.50	1.14	0.81	0.77	1.29	
s%	16	8.8	7.8	12	8.9	4.1	

A_1 Flow = 5535 kg/hr

$$A_1 \text{ Flow}_x = \frac{5535 \text{ kg}}{\text{hr}} \times \frac{\text{kg-mole}}{19.39 \text{ kg}} \times \frac{\text{MW x}}{\text{kg-mole}} \times \frac{\text{conc x}}{} = \frac{\text{kg x}}{\text{hr}}$$

	kg/hr
H_2S	39.6
H_2	220
CO_2	1840
N_2	520
CH_4	397
CO	2530

*Process GC data.

**Means and standard deviations are based on individual data points for the entire time period rather than on the hourly averages presented here.

TABLE B-4. SELEXOL ABSORBER OUTLET GAS COMPOSITION
(Run 19A Period A_1, 4/21/82, 1000-2200 Hrs)

	Volume Percent - unless noted							
4/21/82	H_2S**	COS**	H_2	CO_2	N_2	CH_4	CO	
1000	<3	70	40.1	15.3	7.7	7.7	29.4	
1100	<4	75	40.3	15.0	7.2	7.8	29.6	
1200	<4	78	40.1	15.0	7.2	7.8	29.9	
1300	--	--	--	--	--	--	--	<3 det/hr
1400	<4	75	44.9	13.5	6.2	7.4	28.0	
1500	--	--	--	--	--	--	--	<3 det/hr
1600	<4	78	41.3	13.6	6.1	8.7	30.3	<4 det/hr
1700	<4	82	40.2	13.5	6.0	9.1	31.2	
1800	<4	78	41.2	13.4	5.9	8.4	31.2	
1900	<4	83	--	--	--	--	--	<3 det/hr
2000	<4	80	40.4	13.4	5.8	8.8	31.6	
2100	<4	80	40.5	13.5	5.7	8.6	31.8	
2200	<4	83	41.1	13.1	5.6	8.3	31.9	
$\bar{x}$ ***	<4	78	41.15	13.80	6.22	8.30	30.53	$\overline{MW}$ = 18.51
s ***	--	4.9	1.89	0.76	0.69	0.84	2.06	
s%	--	6.3	4.5	5.5	11	9.6	6.7	

A_1 Flow = 5400 kg/hr

$$A_1 \text{ Flow}_x = \frac{5400 \text{ kg}}{\text{hr}} \times \frac{\text{kg-mole}}{18.51 \text{ kg}} \times \frac{\text{MW x}}{\text{kg-mole}} \times \text{conc x} = \frac{\text{kg x}}{\text{hr}}$$

	kg/hr
H_2S	<0.04
COS	1.36
H_2	240
CO_2	1770
N_2	508
CH_4	387
CO	2490

*Process GC data.
** = PPM
***Means and standard deviations are based on individual data points for the entire time period rather than on the hourly averages presented here.

TABLE B-5. SELEXOL ACID GAS COMPOSITION*
(Run 19A Period A_1, 4/21/82, 1000-2200 Hrs)

$$A_1 \text{ Flow} = 270 \text{ kg/hr}$$

$$A_1 \text{ Flow}_X = \frac{270 \text{ kg}}{\text{hr}} \times \frac{\text{kg-mole}}{37.50 \text{ kg}} \times \frac{\text{MW x}}{\text{kg-mole}} \times \text{conc x} = \frac{\text{kg x}}{\text{hr}}$$

	Concentration %	kg/hr
H_2S	22.1	54.1
COS	1.5	6.48
CO_2	57.8	183
N_2	3.2	6.45
CH_4	16.4	18.9
O_2 + AR	0.43	

$$\overline{MW} = 37.50$$

*Manual analyses only, ~2 data points/species.

TABLE B-6. MASS FLOW RATES FOR SELEXOL MAJOR GAS STREAMS
(Run 19A Period A_2, 4/22/82, 0200-1400 Hrs)

Species	Mass Flow (kg/hr) Absorber Inlet	Absorber Outlet	Acid Gas*
H_2S	41	<0.04	(48.8)
H_2	224	220	(--)
CO_2	1800	1710	(202)
N_2	529	473	(12.5)
CH_4	399	377	(6.93)
CO	2590	2400	(--)
COS	--	1.25	

	$\frac{O}{I^{\dagger}} \times 100$
H_2S	119
H_2	98
CO_2	106
N_2	92
CH_4	96
CO	93

(Supporting data attached in Tables B-7, B-8 and B-9)

( ) Manual GC data, 1-2 data points.
*Flow rate assumed the same as Period A_1.
$\dagger O/I = \frac{\text{Selexol Absorber Outlet + Selexol Acid Gas}}{\text{Selexol Absorber Inlet}}$

TABLE B-7. SELEXOL ABSORBER INLET GAS COMPOSITION
(Run 19A Period A_2, 4/22/82, 0200-1400 Hrs)

	Volume Percent - Unless noted					
4/22/82	H_2S	H_2	CO_2	N_2	CH_4	CO
0200	.41	38.7	14.3	7.0	8.6	31.5
0300	.41	38.7	14.1	6.7	8.2	32.3
0400	.42	38.5	14.2	6.9	8.8	31.7
0500	.42	38.6	14.1	6.3	8.6	32.3
0600	.42	39.0	14.1	6.1	8.7	31.9
0700	.42	38.9	14.1	6.1	8.7	32.2
0800	--**	--	--	--	--	--
0900	--	--	--	--	--	--
1000	--	--	--	--	--	--
1100	--	--	--	--	--	--
1200	--	--	--	--	--	--
1300	--	--	--	--	--	--
1400	--	--	--	--	--	--
$\bar{x}$ ***	0.417	38.74	14.12	6.53	8.62	31.98
s***	.0093	0.40	0.24	0.38	0.38	0.53
s%	2.2	1.0	1.7	5.8	4.4	1.7

$$\overline{MW} = 19.29$$

$$A_2 \text{ Flow} = 5576 \text{ kg/hr}$$

$$A_2 \text{ Flow}_x = \frac{5576 \text{ kg}}{\text{hr}} \times \frac{\text{kg-mole}}{19.29 \text{ kg}} \times \frac{\text{MW} \times \text{kg}}{\text{kg-mole}} \times \text{conc } x = \frac{\text{kg } x}{\text{hr}}$$

	kg/hr
H_2S	41.0
H_2	224
CO_2	1800
N_2	529
CH_4	399
CO	2590

*Process GC data.
**Instrument off-line.
***Means and standard deviations are based on individual data points for the entire time period rather than on the hourly averages presented here.

TABLE B-8. SELEXOL ABSORBER OUTLET GAS COMPOSITION (Run 19A Period A_2, 4/22/82, 0200-1400 Hrs)

	Volume Percent - Unless Noted							
4/22/82	H_2S**	COS**	H_2	CO_2	N_2	CH_4	CO	
0200	< 4	74	40.2	13.8	6.7	8.4	30.9	
0300	< 4	78	39.8	13.7	6.6	8.3	31.5	
0400	< 4	79	39.8	13.7	6.6	8.3	31.2	
0500	< 4	82	39.2	13.7	6.3	8.6	31.6	
0600	< 4	80	40.3	13.8	5.9	8.5	31.5	
0700	< 4	80	40.1	13.7	5.7	8.5	31.6	
0800	--	--	--	--	--	--	--	< 3 det/hr
0900	< 4	82	41.0	14.6	5.5	8.5	30.3	
1000	< 4	76	40.4	14.8	5.8	8.5	30.5	
1100	< 4	76	39.4	15.0	6.1	8.2	31.2	
1200	< 4	71	39.6	14.6	6.2	8.5	31.1	
1300	< 4	69	39.5	14.6	6.1	8.7	31.1	
1400	< 4	70	--	--	--	--	--	< 3 det/hr
$\bar{x}$***	< 4	76	39.92	14.17	6.15	8.57	31.16	$\overline{MW}$ = 18.85
s***	--	5.7	0.58	0.55	0.40	0.48	0.55	
s%	--	7.5	1.5	3.9	6.5	5.6	1.8	

A_2 Flow = 5183 kg/hr

$$A\ \text{Flow}_X = \frac{5183\ \text{kg}}{\text{hr}} \times \frac{\text{kg-mole}}{18.85\ \text{kg}} \times \frac{\text{MW x}}{\text{kg-mole}} \times \text{conc x} = \frac{\text{kg x}}{\text{hr}}$$

	kg/hr
H_2S	< 0.04
COS	1.25
H_2	220
CO_2	1710
N_2	473
CH_4	377
CO	2400

*Process GC data.
** = PPM
*** = Means and standard deviations are based on individual data points for the entire time period rather than on the hourly averages presented here.

TABLE B-9. SELEXOL ACID GAS COMPOSITION (Run 19A Period A_2, 4/22/82, 0200-1400 Hrs)

A_2 Flow Rate Assumed = 270 kg/hr

$$A_2\ Flow_X = \frac{270\ kg}{hr} \times \frac{kg\text{-}mole}{39.87\ kg} \times \frac{MW\ x}{kg\text{-}mole} \times conc\ x = \frac{kg\ x}{hr}$$

	Concentration (%)	kg/hr
H_2S	21.2	48.8
CO_2	67.7	202
N_2	6.6	12.5
CH_4	6.4	6.93
$\overline{MW}$	39.87	

*Manual analyses only, 1-3 data points/species.